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Collective Review

A SUMMARY OF DEVELOPMENT IN PLASTIC SURGERY FROM 1905 TO 1955

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PLASTIC SURGERY'S PROGRESS during the past 50 years has had a tribute paid to it by Michael Mason, in his announcement of a series of reviews of surgical specialties in the INTERNATIONAL ABSTRACTS OF SURGERY, and it is with appreciation that Doctor Mason is quoted:

"Plastic surgery has not only grown into adulthood since the early part of this century but has made a real impact on all surgery. The past war has seen the triumph of plastic surgery and the growth of a whole group of plastic surgeons, serious-minded and earnest in the development of this important field. The plastic surgeon, with his meticulous technique, his respect for tissues, his insistence on careful hemostasis and respect for blood supply, his demand for fine instruments and suture material, and for accurate closures has called the attention of surgeons to the importance of these principles in all surgery. Plastic surgery is no longer synonymous with skin-grafting; the plastic surgeon has put skin-grafting where it belongs, as a technique of surgery applicable to all fields of surgery, just as is suturing or hemostasis." Such recognition is also a challenge to keep pace in the years to come as an essential field of surgery. Plastic surgery stands alike in development with seven of the other fields in this series of twelve reviews.

To try to review or to list credit of all articles on plastic surgery effectively would not be possible, as Michael Mason has said, in his introduction, regarding the impossibility of 100 per cent coverage in abstracting. For example, one review concerning plastic surgery of the nose alone contained more than 800 references, one book on skin grafting also more than 800, and one review on transplantation more than 800, and there were yearly reviews of more than 300 articles. Doctor Mason has therefore extended to me the privilege of writing a synoptic summary regarding general plastic surgery, without the recording of the several thousand references that have been considered for these notes. The present status of plastic surgery is therefore presented more for the general reader as a summary of what the patient may expect at this time after 50 years of development than for the plastic surgeon who has access to the literature for each subject. From the material in these general considerations it will be possible to present reviews of individual subjects with full documentation.

General plastic or reconstructive surgery has received varied recognition among surgeons. It may occupy an established position and an in-

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dependent service in one medical organization, while in another, work that would fall into its category may be dispersed over several services depending upon the anatomical field into which the various lesions fall. However, there is evidence that a plastic surgery department may relieve other services to a worthwhile extent, and general plastic surgical services are comparable to general surgical services in affording groundwork training. Although often thought of as working in a limited field, the general plastic surgeon may be called on to carry out a large variety of procedures.

GENERAL PLASTIC SURGERY

This has been well defined to include treatment of patients falling into these groups:

1. Those with injuries and deformities of the face and jaws that may alter the shape of the bone structure, leave disfiguring scars of the soft tissue, or result in abnormal function and physiology. These lesions require the work called maxillofacial surgery.

2. Those with injuries and deformities of any part of the body that require skin grafts or flaps, scar adjustments, or surface tissue readjustment.

3. Those with serious burns which may not be regarded initially as requiring ultimate restoration of the surface, but which are apt to do so and which, from the start, might be benefited by the opinion and care of a plastic surgeon. To these may be added those with tumors of the face, mouth, jaw, and neck that require reconstitution after removal.

Surgeons who work in an established field of general plastic surgery must necessarily rely on help from those trained in anatomical, biological, physiological, and pathological fields, as well as all surgical and dental fields. In other words, the individual patient is the real consideration and whatever is best for him is the goal.

The plastic surgeon follows and uses the results of research in pathology, physiology, chemistry, genetics, neuropsychiatry; he utilizes general basic advancements in the care and protection of patients undergoing surgery, while his investigation is mainly in his own field. However, he can still be a pioneer or frontiersman in ferreting out simplification and directness in his general problems and in perfecting the technical skill that is so essential if patients are to have the greatest benefit. His co-operation with other services and other specialties based on anatomical grounds is one of his best contributions. The evident fact "that deep healing can be no better than the surface healing" has led the way for a very close working relationship of the neurosurgeon and orthopedic surgeon with the plastic surgeon, and because of plastic methods of preparing and repairing wounds, many lives have been saved and much function restored, especially in the military services. Many of these methods have been advanced to a point in plastic surgery where they become standard surgical procedures available to all surgeons.

The military influence on plastic surgery has been great. Modern plastic surgery received its start in World War I, and what was learned then was transferred to civilian use. During the intervening 25 years, great strides were made so that the tables were reversed in World War II in that civilian-gained knowledge could be turned back to the services for immediate use.

Within the United States Army and Navy during World War II were built the largest plastic surgery services in the history of surgery, and again young civilian surgeons gained knowledge in the services that could be given back to civilians. Before the war, however, the bases and possibilities of work had been established, and the younger surgeons could go ahead under the guidance of civilian surgeons in the services.

An item of interest in the change in plastic surgery, from one war to another, is the use of free skin grafts. In a three hundred page report from World War I, no mention was made of skin grafts except in one sentence. Neither was any mention made of burns. In World War II, however, about one-third of the work in plastic surgery was done with free skin grafts, and about one-third was done on patients with burns. As one pioneer in plastic surgery residing in another country said during World War II, "The things that are routine procedures in this war would have been considered fantastic in the last one."

A former president of the American College of Surgeons in the Surgeon General's Office in World War II, in a tribute to plastic surgeons in the service, said:

"They were always numerically in short supply, but they carried an enormous burden of work. Many of these highly skilled surgeons had to be kept in the Army long after they could have been released on points, because the work they were doing could be done by no one else."

Highlights of the specialty in World War II were listed as:

1. The elimination of tannic acid in the management of burns and the substitution of atraumatic care of the wound, the use of pressure dressings to prevent loss of fluids and blood, and early skin grafting.

2. The early closure of wounds, either by grafting or by suture, with or without the utilization of flaps.

3. The establishment of specialized centers and of specialized teams in the combat zone for the immediate care of casualties suffering from burns and facial injuries. The superior functioning of these services cut down very materially the time required for the definitive and long-drawn-out plastic repairs to be done in the Zone of the Interior.

4. The extensive use of local tissue in repairs.

5. The fundamental principle of wound closure, which was highly developed by plastic surgeons and which was used in many cases preliminary to secondary orthopedic or neurosurgical procedures on the deeper tissues.

6. The concept that deep healing can be no better than superficial healing.

7. The close co-operation of plastic surgeons with dentists, anesthetists, orthopedic surgeons, neurosurgeons, and the nursing service in the management of their casualties.

8. Special procedures devised for the management of injuries in particular regions, including the palate, jaw, nose, the ear and other parts of the face, and the lower extremities and the hands; the composite free graft from the ear is a notable advance from World War II.

"The miracles of reconstruction performed by the plastic surgeons would have been impossible without the courage and the will to live displayed by these young men who seemingly had been marred for life, and without the industry and confident hope of the surgeons who restored them to lives of useful activity. Medical history has no finer example of the doctor-patient relationship, and plastic surgeons have every right to be inordinately proud of what they accomplished."

In this field of surgery it is difficult to get away from the doctor-patient relationship. The demands of the patient through a long series of operations will not allow it in the first place, and the clinical results cannot be good without it in the second place, and there is some intangible feeling of the surgeon for his work that does not allow widespread mass production of the important details of repair. This might be called individual artistry, but the results are so far short of artistry that the surgeon does not like to be stigmatized with it, or thought of as being able to make things perfect. He aims at function first, and with this goes a plan and effort to restore contour and smoothness to as near normal as possible.

Much plastic surgery had been predicated on the repair of defects resulting from cancer, but the older patients with lax tissue available for repair do not present the same problem as the child or the youth who has had his face blown away in a second with destruction of features that he has developed for many years and counted on to carry him through life. These young patients deserve having the minimal of additional scarring and having repairs that would give the least possible residual deformity. They do not have the excess local tissue to work with and often require additional tissue from another part rather than radical mobilization and additional visible scarring.

The plastic surgeon realizes that he is only making substitutions for losses. He learns to use every bit of local tissue available, but he also learns not to sacrifice adjacent features or function or nerve supply to avoid bringing in new tissue. It is one thing to utilize local tissue, but the final *sine qua non* of a plastic surgeon is to be able to add more tissue from a distant part, either as a free graft of skin, fascia, cartilage, bone, or as a pedicled flap.

Chemicals may come and chemicals may go; one service or one hall of learning may prove a method of repair, only to have it replaced by another method. However, in caring for patients the approach of cleanliness, of doing no further harm, of gentleness, and of a willingness to use all the elbow grease necessary will be as important a thousand years from now as it is today. Without such approach the best service cannot be given, and this is, in essence, a surgical principle taken from the golden rule laid down about 2,000 years ago.

FREE SKIN GRAFTS

Free skin grafting is a rather recent development which is not yet widely understood or appreciated. Although pedicled flaps of subcutaneous tissue and skin were occasionally transferred in ancient times, pinch grafts were first described

by Reverdin in 1869 and full-thickness grafts by George Lawson in 1870. Ollier described in 1872 both full-thickness and partial-thickness grafts of from 4 to 8 sq. c. in area and apparently realized some of the possibilities of covering large areas with partial-thickness grafts if a satisfactory method of cutting them could be developed. In 1874 Thiersch published a report on a small series of patients on whom he later used these grafts. Following this, the idea became widespread that such grafts should be cut extremely thin in order to leave some of the surface epithelium behind to heal the donor site. This necessitated the use of little, thin chips of graft, which became known as "Thiersch grafts," "epidermic grafts," or "razor grafts" and were so generally unsatisfactory for resurfacing that their use was limited to healing small refractory ulcers. Skin grafting changed little during the next 50 years, which was the "golden age of abdominal surgery" and during which most surgeons were occupied in bringing this specialty into full flower.

About 25 years ago, a revolution occurred in skin grafting as the result of three developments:

1. It finally became apparent that the dermal pad is the most important part of a skin graft in producing a new, tough, resilient surface.

2. It was demonstrated that the donor site epithelium, after removal of a partial-thickness graft, regenerates from deep islands of hair follicle and sebaceous-gland epithelium. This meant that the grafts could be cut as thick as possible, rather than as thin as possible, and that useful amounts of this dermal pad could be transferred without interference with the healing of donor sites.

3. Since the grafts were to be cut much thicker, it was possible to devise instruments for cutting really large grafts. These thicker grafts were named "split grafts," as the process of cutting them seemed similar to the splitting of leather in a harness shop.

For the first time, large areas could be resurfaced satisfactorily and could be measured in terms of square feet rather than square centimeters. These split grafts, in sheets, were so superior that pinch grafts practically dropped out of general use. Many old rules were abandoned when it was found that contracted axillae and necks could be repaired much better with these grafts than with pedicled flaps. Conversely, the use of the split graft for covering donor areas increased the facility of transferring large flaps or free full-thickness grafts. Skin grafting became a routine rather than a rare procedure.

The surgeon no longer has to decide whether a wound will finally heal spontaneously without grafting. Rather, he has to decide whether a better final surface will be obtained with a graft, or whether the convalescence of the patient can be shortened weeks or months by grafting.

By trial and error, procedures have been developed which practically assure the "take" of a skin graft. In many instances, this means close personal attention to details by the surgeon to obtain success. Some of these important details are likely to be considered "trivia" by the surgeon who does only occasional skin grafting. This sometimes leads to the publication of reports of "new" procedures by which a few grafts have been done with 60 or 70 per cent "take," but it should be realized that something serious has gone wrong whenever a single graft is lost. New procedures are being developed, but they should lead to routine success in the "take" of grafts to be worthwhile.

To cut a graft it is necessary to produce a tight or firm drumhead of skin. Simple retraction of the donor site from end to end with boards or tenacula is the earliest and simplest way, a suction retractor with a long sharp knife is another means of freehand cutting of grafts, and a suction machine is also available. Other devices, dermatomes, depend on adhesives to attach the skin to a cylinder, thus creating the drumhead for cutting. There are several of these machines —dermatomes—available and another type, electrically driven, that does not require glue, but depends on a fast short stroke of the blade and downward pressure as in the earliest freehand fixation.

A dermatome or any single instrument does not make a plastic surgeon out of its owner, any more than a gallbladder spoon would be sufficient for removal of a gallbladder. These machines can do harm if they cut too deep, and occasionally a patient may show more trouble in a donor site than in the original injury.

With all these aids and with the procedures, pathology, physiology, and histology described concerning the transplantation of skin in the past 25 years, free skin grafting has been standardized and given to surgery in general as an adjunct to be used in any field. This is one of the most important contributions of plastic surgery to the whole field of surgery, as Michael Mason has

mentioned, and may be taken as some compensation for the many useful procedures plastic surgery has adopted from other fields.

To repeat, the change from World War I to World War II is best realized by there being only one line in 300 pages of the report from the Surgeon General's Office in World War I on free grafts (and no mention of burns), whereas in World War II the plastic (and other services) used free grafts routinely, and on the plastic services in the army, at one time, there were 33,000 operations calculated to be done on patients, most of which were to be skin grafts.

Healing of donor sites of split skin grafts requires a separate paragraph to recall that it has been shown that the deep epithelial cells, finding their surface missing, de-differentiate back to squamous epithelium in about 6 days with full surface coverage and in another 6 days no dressing is required. This may be thought of as somewhat of a reversal of the formation of the cancer, in which the cells go down and invade the host, whereas in the healing of a split graft donor site the deeper cells go back up to the surface to save the host. This study of epithelial healing and cell movement is one of the most important in wound healing and the ability of the surface to heal if the full complement of the skin has not been lost is the basic reason for the use of split grafts in the repair of extensive burns. The healing of burns under all sorts of therapy and with all sorts of applications can thus be assessed.

This healing does not occur if the donor site is irritated by strong chemicals, bacteria, or trauma, but instead the partial thickness loss of skin is changed into a full thickness loss and delayed healing and scarring result.

Tannic acid and other strong chemicals and all methods of care that do not protect this delicate healing surface in superficial burns were seen to be impractical and even dangerous because of the realization of the natural process of healing of these superficial losses. Tannic acid being the chemical that turns hides into leather, it seemed unlikely to be a universally good application to apply to the struggling epithelial cells in babies' burned skin, or to the donor site of a graft.

Tannic acid died a hard death in the treatment of burns, but it had sporadic outcroppings even after general disuse—one when sulfonamides came in and the two were mixed together.

These elements of the care of wounds and avoidance of strong chemicals are among the most important contributions by plastic surgeons.

The care and grafting of deep burns and final rehabilitation of the patients occupies about one-third of the work in plastic surgery. Reports of clinical and laboratory investigations are so voluminous as to preclude anything but a summary here.

Patients with large full thickness loss of skin from burns require skin grafting for healing, function, and rehabilitation, and this group presents a major problem.

In the extensive literature, much effort has been directed toward some method of local care, to taking care of acute and chronic shock, and to problems of deranged blood chemistry and metabolism. This work has been of great benefit and has stimulated a burn consciousness, so that excellent care may be afforded burned patients and many more lives are saved, thus adding to the numbers who require later grafting and reconstruction. There still is, however, a lack of reports of completed care of patients who have been badly burned and not only have been saved from death but have had satisfactory surgical repair of open wounds and contractures and have been rehabilitated to useful life. In fact, the death rate from severe burns has remained about the same for many years because, although the patient may be carried through the shock period, he may die later from open wounds and as he can only die once, the death rate is the same.

One difficulty arises from the interpretation of "superficial" and "deep" burns and the healing processes of both. The recording of various degrees of burns may be a stumbling block, and the degrees could be replaced with a classification of "superficial," "partial thickness" or "full thickness" loss, and "deep burn" reserved for full thickness loss. Superficial burns may not have any deep areas, but deep burns nearly always have superficial areas. The determination of these depths is often difficult and should lead to a conservative attitude toward immediate or early excision of burns.

If full thickness of skin is burned away over a large area, there will be contraction and distortion and loss of function unless the lost skin is restored. Epithelium will regenerate, but the full complement of the skin will not. The patient will require a pad of derma to receive the blows and trauma and to adjust to the temperature changes of his environment.

A basic plan of repair of large full thickness losses of skin may be (1) to get the area as clean as possible, as soon as possible, and (2) to restore what skin has been lost. This should reduce scar formation to a minimum; then, when the wound is healed and the patient has recovered, one may proceed with any necessary secondary repairs for the release of unavoidable distortion or for restoration of features and contour anatomy and function.

Almost any treatment that promises as little work as possible for the fresh burn is apt to become popular; however, so far no application has been found that will produce normal skin in wide full thickness losses. When it is claimed that a certain preparation or type of treatment will insure complete healing without scarring, it apparently is not generally realized how healing occurs in either superficial losses of skin or in full thickness losses of skin.

If there is rapid healing and return to function following a burn without much scarring or deformity, this means that the full thickness of the skin has not been lost and that regeneration has occurred from the deep glands in the derma, much the same as occurs in the donor site of a thick split graft. It has been observed that healing of these struggling cells is interrupted by chemical, bacterial, or mechanical trauma. Therefore, it appears that cleanliness, protection, and the avoidance of strong chemicals will promote this type of healing, and these objects of treatment have stood the test of time. It is obvious that a dirty dressing, leaving a coating of pus over a partial thickness burn, would be apt to stop healing and that such a partial loss might be changed to a full thickness loss. This same finding is true in coagulum methods of treatment, whether the coagulum is formed by chemicals or is a natural one on the wound. It seems unnecessary to mention that tannic acid is the chemical used to turn hides into leather and that such strong chemicals can be injurious to healing tissue.

Tannic acid had its great advocacy because of the apparent ease of care; however, its use should be avoided as well as that of silver nitrate, and other irreversible methods. Such procedures as the amputation of arms because the hands are burned (as was carried out by the enemy in World War II) form the most irreversible procedures. Skeletal traction through the finger tips does not appear warranted routinely to elevate the arms and in a large series would probably do as much harm as good.

Early grafting is done in deep burns before irreversible chronic shock and general debilitation occur. Most burns can be ready for grafting in 2 weeks, and agents and enzymes to hasten the separation of sloughs prove of worth. If exposed bone or tendon persists, grafting can be carried up to these areas and as much healing as possible obtained. Flat surfaces can be repaired by excision and grafting, but not the face, genitalia, or feet.

The technique of *immediate excision and grafting* is limited to areas that have been burned with hot metal or other agents, leaving a definite outline of damage, and should not be applied to the face, hand, foot, or genitalia. However, on flat surfaces where the patient can stand the procedure of excision, it is advantageous at times. Early grafting, as just noted, is probably safer and more applicable.

For making extensive repairs, such as 250 sq. in. being transferred at one time, it is essential that a method of grafting be used in which prompt healing of the donor site will result. For this the thick split skin graft is used, with careful cutting of the grafts. If they are cut too deep, added crippling may occur; in some patients, trouble in the donor site has exceeded that of the original lesion.

Four phases of care of deep burns. Homografting may be considered as the second in four phases of care and rehabilitation of extensive deep burns. First is the prevention of shock, and the maintenance of fluid balance, nutrition, and blood elements. Second is homografting for emergency "biological dressings" of open areas to tide the patient over the critical period, if possible. Third is flat surface autografting, to give permanent wound closure and healing. Fourth is final rehabilitation by plastic surgery, including reconstruction of flexion deformities and restoration of hand function. Another long and important element of this fourth phase is resurfacing and rebuilding of faces and features to give restoration of the best possible contour anatomy.

Homografts as Emergency Biological "Dressings"

It may be a life-saving process to go to the trouble of applying large sheets of split homografts in patients who cannot stand a long operative procedure, and who are "slipping" daily

from debilitation and pain. Homografts take almost as well as autografts, and survive from 3 to 10 weeks. During this period, the patient is given a respite from pain and dressings, his general condition picks up, and there is a stimulus to his own epithelization, so that complete healing may occur even after absorption of the grafts. This notable increase in wound healing has caused some observers to think that homografts survive permanently. The grafts absorb in a rather clean fashion, just fading away from the third week on, without infection usually, and leaving a clean granulating base.

There does not seem to be any relation of the "take" of a homograft to the blood group, even though the blood has been grouped down through the M. and N. groups. If these grafts could be made to survive, one of the greatest problems in plastic surgery would be solved. Homografts in identical twins have been shown experimentally, to survive permanently and if a twin were burned, homografts from the other twin could be used with a good chance of their surviving.

It has been urged that ACTH, antihistaminics, estrogens, and other agents would prolong the life of a homograft, but it is possible that the body just cannot throw the grafts off as fast when ACTH has been given. Loss of resistance to infection seems to occur following the use of ACTH, and in severe burns this outweighs the theoretical good of ACTH for prolonging the life of homografts. The permanent persistence of homografts is still wide open for investigation and solution, but it may be almost like going back to "first causes," and we may not see the solution.

Repeat sets of grafts have been used up to six times in the same patient, aiding the patient's recovery in all instances. It is possible that each succeeding set might persist for a shorter period, but with diversification of the donors, and if the specificity of allergic response is true, then skin from different subsequent donors could be expected to persist over a worthwhile period. The number of "sets" of homografts would seem to be limitless if there were not some general revolt to their persistence.

"Walking around in skin from another person" is practical as well as intriguing, and elements of how soon a burned patient could do this, and for how long he could do it, are to be worked out while we are on the long wait for the permanent persistence of homografts to be realized.

Postmortem homografts may be obtained from patients soon after death and used the same as fresh homografts.

The method provides large amounts of grafts from a single source without disfiguring the donor patient, and it avoids discomfort and time loss to comparable live donors, as well as attendant wound care, pain, and occasional surface scarring. There can be a large saving of operative time and expense, and the complication of having 20 to 30 donors to deal with for a single recipient patient is avoided, which eliminates physical examination, anesthesia, and postoperative care.

The advantages of obtaining from a single patient after death large sheets of split skin homografts versus the disadvantages of obtaining a similar large amount from live donors are almost too obvious to mention.

Armed services could record of each member if permission for such a procedure would be granted in case of death; civilians could declare their wishes in case of death to a central registry, and thus in case of severe emergency the mechanism for obtaining large amounts of the best possible "biological dressing" would be established. This would seem as practical and as easy of public acceptance and of implementation, as the Red Cross's obtaining blood from live donors.

National defense could include studies and direction of a national plan for this procedure. However, local adaptation is possible even for small hospitals or for the individual patient in need. The main idea is to try to save the life of each individual patient, and this does not require anything but proximity to, availability of, and the mechanism for transferring skin from a patient who has just died to one in need.

At a national defense level the need would be mainly to educate the public to acceptance, and to the possible development of a central registry and collecting agency, if methods of preservation prove successful. This might even be included in the blood donor notation. The thought may be unpleasant, but this should be a matter of example, explaining possible need, and of letting the public in general know how truly horrible severe burns and skin losses can be and the extreme cost of their care. Put in a plain way, a large amount of good, usable skin is going to waste that could be life-saving, if the details of procurement and application of postmortem homografts could be worked out.

The final death of skin (and other organs) does not occur at the same moment as cessation of breathing and circulation (somatic or systemic death). There is a period of continued viability or respiration of the skin, and it is this differential in times that makes this method possible. Investigations are being continued of this differential of times of death, with a view of determining the limits of survival and the optimal time for removal.

Patients as preservers of skin. For the present, from a practical standpoint, we can look on the patients who donate their skin after death as "preserving skin" by their natural life. The differential in time of systemic death and final death of the skin makes it possible to obtain viable grafts after death.

Preservation of skin after removal from patients (either live or after death) is possible for several hours, or even days, by simple cold storage, so that leeway is possible for the utilization of skin donors. For example, in military situations it would be possible to ship donor skin within limits of time.

Preservation of Homografts

This follows as the next step in the general problem and much investigation is being done on it. The following practical methods of short-term storage of homografts can be carried out in any hospital or location without any special equipment. Preservation of grafts for later use can be done by folding the graft on itself and keeping it moist in a sterile jar at ordinary icebox temperature, above freezing. Under these conditions postmortem skin has been found viable up to one month. Storage in 10 per cent serum and buffered electrolyte solution may further prolong survival, and the addition of adenosine, as has been suggested for the preservation of blood, may prove to be advantageous. Postmortem grafts have remained viable and have been used successfully taken hours and even days after the death of the donor if the body has been kept cool during this period. This factor is thought to be of particular importance in dealing with widespread disaster on a national basis, in which event there might be some necessary delay in securing available skin for use.

Long-term preservation of viable homografts is being investigated in several places. If developed to a practical point, this will be of great value in the shipping and long-term storage of postmortem grafts for use on a national basis. Antifreeze agents at low temperature are being studied clinically and experimentally on this service for preservation at very low temperature; this method may supply viable grafts even after long periods of storage. Vitrification has been studied, but it is expensive and so difficult as to be of questionable practical value. Freeze-dry methods for nonviable grafts, which have been developed elsewhere and are being worked on here, may give the most practical long-term storage. However, important points are that freeze-dry grafts are not viable; that viable homografts, after application, probably last longer than nonviable freeze-dry grafts; and that viable grafts give a firmer "biological" closure of the wounds, which should afford a more normal surface coverage for protection of the wounds and maintenance of the general condition of the patient. It is interesting that a freeze-dry preparation of a great vessel may actually be more successful than a freeze-dry skin graft, the endogenous position apparently lending itself to repair and substitution more permanently than the external repair. It is possible, however, that freeze-dry grafts may come to be of great practical usage.

The essential idea of this method is that a person who dies may save the life of another person, even after his own death.

In summary of this important subject it may be said that studies on the storage methods of various tissues have opened up many fields for investigation as they apply to the use of split-thickness iso and homologous skin grafts. Nonviable skin stored by the freeze-dried method has the advantage that it probably can be stored indefinitely at room temperature. This skin, when re-moistened, has the appearance of live skin and although it is nonviable, it appears to prevent loss of tissue fluids and acts as a barrier to infection when applied to open wounds.

Of the methods presently in use for storing skin in the viable state, the balanced salt nutrient media method at icebox temperature has given the longest storage periods. However, in centers where a supply of postmortem grafts is usually available on demand long term storage is not necessary, and the simple method of storage in moist saline gauze at icebox temperature has proved satisfactory.

The application of the concept of bringing the metabolic rate to approach zero by very low

temperature so that prolonged storage can be accomplished is feasible by two methods. The first, called vitrification, is technically difficult because it depends upon a cooling method so rapid that molecular movement is stopped before ice crystals can grow to significant size. This lowering of temperature may have to be as rapid as 100 to 200 degrees per second.

The second low temperature method of utilization of anticrystallizing substances involves the principle of dializing such substances as glycerol into the cell, which in turn prevents hydrogen bonding from the dihydro and trihydro forms of water to the quadhydro form, thus preventing the growth of ice crystals. Although a final workable method has not yet been worked out, encouraging results are being obtained in laboratory investigation coupled with the use of human skin studies.

Not yet feasible but equally challenging is the problem of using tissue culture as a source of homografting. It has been suggested that isografts might be used as permanent coverage in those unfortunates who usually survive burns but who are without enough intact integument for final reconstruction. Such grafts would have to contain something more than epithelium for final protective covering, and this element also is a challenge.

Whether it will ever be possible for a recipient to incorporate into his own economy and metabolism a viable homograft to survive as a permanent part of his being is being elaborately investigated. So far, however, the only permanently surviving homografts in human beings are those from identical twins and the search for the most useful skin storage needs to be continued.

Repair of Contractures and Rehabilitation

Technical procedures and short-cuts in early care are of importance, but not so much so as to cloud the fact that full thickness of the skin has been lost in many patients and that a great problem in rehabilitation is the late grafting and repair of contractures and distortions, and the replacement of lost features. This echelon of plastic surgery is sometimes overlooked. Loss of features and sight, because of damage to the lids, may follow facial burns. Even with the early grafting of raw areas, lost features still have to be rebuilt.

Burned hands are a close second to burned faces in problems of reconstruction, although they respond better to early grafting than do faces. This subject will be included in Doctor Mason's article.

Direct Flaps with Short Broad Pedicles

One of the most useful methods of repair is that of a flap of skin with its blood supply intact until there is attachment in the donor site. The classic example of this is in the Italian nasal reconstruction method of a flat flap on the arm, which tubes itself on being put up. The next method of flap preparation is the tubing of the flap while still in its original bed in an effort to insure a longitudinal blood supply.

Short, broad-pedicled flaps have been used extensively in the past 15 years to replace tubed flaps. These are most applicable to the hand and arm following crushes and gunshot wounds that leave large defects.

These areas can be repaired with direct abdominal and chest flaps, by using the principle of a short, broad pedicle which will allow complete mobilization and immediate use of the flap. There is rarely any need for delaying or tubing flaps for these repairs.

This procedure has been carried out in large numbers of patients, and a valuable saving of patient hospital weeks has been possible. Whereas, long-tubed flaps or delayed flat flaps have been known to require months of preparation, this direct type of flap is prepared in 10 to 30 minutes, and usually can be detached in 14 to 20 days. Therefore, the crippled extremity is freed of its scar by thorough dissection, the flap is prepared accurately, and, at the same time, the arm is "planted" under the flap, with the result that in 2 to 3 weeks the arm or hand can be detached from the abdomen and the wound closed. This flap is soon ready for use, or for any necessary deep work on bone, nerve, or tendon.

Bone, nerve, and tendon repairs cannot be accomplished successfully through dense scar, because the results of these operations can only be as good as the surface healing. When deep repairs are attempted through excessive scarring, the wounds may break down, and wire, foil, screws, plates, and bone grafts may be lost. The procedure outlined here is of marked importance in the preparation of many areas for necessary orthopedic or neurosurgical repairs.

Permanent pedicled blood-carrying flaps for repairing defects in avascular areas are of marked importance in some instances. In repairing a defect in a heavily scarred area with diminished

vascularity it may be advantageous to use a flap with a permanent blood supply coming in through a permanent pedicle that does not have to be detached from its donor. Such instances are found in radiation lesions, in defects extending into bony cavities, as about the tibia and foot, where bone may have to be replaced, as about the jaw, about the chest and axilla, in densely scarred areas resulting from gunshot wounds and traffic accidents, in extensive war injuries, in defects of the scalp with or without bone loss, defects following tumor removals where bone is exposed, as over the vertebral spines, pelvis, and elbow, and in decubitus ulcers. This type of flap actually adds blood supply to the recipient site instead of depending on the area, as the usual distant flap that does that has to have its pedicle severed.

Along with the blood supply these flaps may carry some nerve supply that may give more tone to the final repair and possibly better sensation. In designing and using these flaps, however, it is advisable not to sacrifice the important adjacent nerve or blood supply, or to distort other functions or features. These flaps are designed not so much for the method or ease of preparation and manipulation, as for the permanence of the pedicle and the blood supply. Although they are rotated into position, they are designated as to their function rather than as to their form, and for this reason the term "permanent pedicled blood-carrying flaps" is suggested. These flaps have been mentioned previously but not by this suggested designation. When a rotated flap, island or arterial flap, palate or cross-lip flap, or any type of flap is used in which the pedicle does not have to be cut, the same process is carried out, but the design to obtain the permanent pedicle is the point of consideration here. Along with this fundamental reason it may be that this is the simplest possible type of repair, and may save many stages and much scarring, as compared to the use of a distant flap.

RESEARCH IN PLASTIC SURGERY

This problem and problems relating to it of both clinical and basic nature are studied actively by both surgeons and workers in basic sciences. This study has developed mainly in the past 25 years, although extensive work on transplantation and on fascia was done earlier. Many of the earlier studies have been overlooked, unwittingly, and reappear, a process that is not limited to the field of plastic surgery. This investigative work centers around tissue transplantation, attaining the persistence of homografts, preservation of the skin and banking of the tissues, wound healing, tissue culture, epithelial movements in wounds, effects of drugs and chemicals on wound healing, tissue chemistry, general and local studies of burns, and determinations of the healing of burns and radiation and atomic lesions. Radioisotopes are used in several fields of study as in all surgical investigation. As may be expected, cortisone, ACTH, antihistamines, and antibiotics are given careful study. Investigation of the circulation in flaps, grafts, and homografts, and of the viability of transplants brings to light explanation of the clinical observations and puts the procedures on a surer footing.

Tissue storage is so important that this is a center for a great deal of work. It is interesting that a nonviable preserved homograft for the replacement of a large vessel is of more permanent application than a small skin graft. The skin graft to be permanent must be viable and from the patient himself, whereas a nonviable homograft to the aorta apparently succeeds in function, if not in persistence, as its own self.

So far the elements for a successful permanently surviving homograft require that it be from an identical twin, be from long inbred strains of laboratory animals, or have some intrauterine preparation to accommodate itself to another animal's chemical economy. It has been suggested that during pregnancy homografts might persist and it has been thought that a sublethal dose of x-ray might see a homograft through a longer period of persistence. In one patient with agammaglobulinemia, homografts were found to persist for 18 weeks. The claim of ACTH to give persistence seems to be outdistanced, as ACTH does not seem to make everyone alike.

The search for some mechanism whereby one animal may accommodate his living, his enzyme systems, or his genes to accept tissue from another animal will go on undoubtedly because the subject is so fascinating and because so much advantage would come from it, but it has been stated in the basic observations of geneticists that each person is different from the other, except as he has been shown in identical twins.

Parabiosis as well as tissue culture has been employed in many studies as a basic investigative

procedure; one long study pertaining to fascia made more than 30 years ago presented most of the known facts, but it has been overlooked several times since then.

These studies are so extensive that a full recording of each one would require unwarranted space here. All of these elements are important as the specialty of plastic surgery progresses, but as in all other specialties the basic scientific work has to come from or be in close co-operation with those basic scientists who do not have the myriad details of reparative surgery to master.

This widespread interest and time-consuming work is one of the best indications of growth and establishment of plastic surgery as an individual field of surgery.

RADIATION LESIONS

Over the years plastic surgery has been used in the care of large numbers of lesions resulting from radiation exposure. Studies of pathology and progress of the lesions have been recorded and methods of repair developed. The addition of atomic sources for these lesions has also been studied and plans of treatment have been suggested and carried out.

The discussion of possible unfortunate ultimate results of radiation may lead to the prevention, recognition, and elimination of these burdensome troubles, and it is further hoped that the suggestion of "changing" the skin in an involved area before serious trouble develops may lead to even wider application of radiation therapy and even more brilliant results.

Sources of burns are vocational, as in doctors and dentists; therapeutic radiation, either in known huge dosage or accumulative small doses as for acne; diagnostic, as in fluoroscopic examination, the lesions of which are frequently missed in diagnosis because of lack of history or lack of suspicion; commercial epilation, this being a source of damage that seems the most useless; and atomic radiation, either in laboratory or test workers, or, of course, victims in war time.

Acute burns result from large single exposures, from exposures repeated closely over a short space of time, or from atomic radiation, and they should be given a conservative type of treatment, especially as far as the amputation of extremities goes. Rest, sedation, prevention of infection, and alleviation of the severe pain are carried out, as well as the grafting of open wounds as soon as it is believed that a free graft or flap will survive. For burns of known surface extent, early excision and repair may be done, but even in these instances there may be surrounding involvement by a chronic process that becomes apparent later.

The chronic burn is the type usually thought of, such as those seen in the hands of doctors. These result usually from repeated small exposures over a long period of years, and the lesions are always getting worse. Acute burns from single exposures may result in the development of chronic changes also, and for this reason, after subsidence of the acute stage, trouble still may be expected.

The lesion in the skin is dangerous because it is a progressive one with the ultimate stage of carcinoma being in sight if the patient lives long enough.

Effective treatment for the usual chronic burn is excision and repair of the defects with free skin grafts or flaps. A paradox is that treatment should be done early, or in a quiescent stage, rather than in an ulcerated infected stage. This is difficult to accomplish even with doctors, but if there is pain as well, it is an impetus to operation. Removal of the area results in the immediate relief of pain, and the patient usually makes this escape the subject of his first expression on recovering from the operation. The repair of the excised lesion may be done either primarily or secondarily, and there are many points of importance in designing and carrying out repairs of these resultant open areas, especially when features are involved.

Persistence of function after repairs following the excision of chronic radiation burns usually occurs and the new skin covering lasts throughout life.

Late necrosis of the underlying structures such as bone and tendons may occur occasionally in severe burns and require excision and repair.

Atomic radiation lesions may increase as work in turning mass into energy increases, and their incidence in the next war may be tremendous.

In time of war, fire and blast injuries may be greater in number than radiation injuries, but some of the individuals surviving the blast and fire, and possibly many relief workers, will suffer radiation burns, and these lesions are under consideration here.

Enough burns have been encountered among workers in the development and production

stage of atomic work to give indications of what to expect as to the requirements of plastic surgery. The lesion produced by atomic radiation is not a new one entirely, but the time element of the development is faster than in the accumulative x-ray burn because of the excessive exposure in a short space of time. These burns usually arise from mistakes in security precautions and add the ever present human element to the ultra in scientific work.

Conservative treatment, especially about the hands, avoiding early amputation, is indicated because hopeless-looking fingers finally may be spared. The relief of pain, prevention of infection, and general supportive measures are the main items of treatment. Blood changes are not significant in patients with exposures over small areas, but there may be emotional disturbances in workers that require patient guidance and the recreation of hope for ultimate survival of the damaged parts.

LESIONS OF THE NOSE AND FACE

Plastic Surgery of the Nose

A recent review of this subject covered 800 references. Only an outline can be given here.

The nose was the field for the first plastic surgery, accounts of which go back to 600 B.C. The first recorded use of pressure dressings in surgery was reported as applied to the nose, in the hieroglyphics.

The exact origin of plastic surgery of the nose is obscure, but India supplied many subjects for replacement because of a form of punishment of cutting off the nose. The method in India was a direct forehead flap with no special reference to providing a lining.

The Italian method was a delayed retrograde flap from the arm which apparently tubed itself.

These two methods, the Indian (forehead) and the Italian (arm flap), remain today as useful procedures with the refinements the centuries would bring, not the least of which must be anesthesia.

For the restoration of a lost nose the adage that a tailor can make no better cloak than the cloth is somewhat applicable because the new nose has to come from the patient himself. Total loss is frequent in military surgery, but not so much so in civil life; it is of exceedingly major importance to the patient.

It is universally established that a nose needs an opening through it, but getting a proper opening and lining is still a great problem. Modern surgeons find it just as true now as in years gone by that there are certain prerequisites for nasal reconstruction, and these may be epitomized by a direct quotation from 1845. "When the nostrils are too narrow or grown together, the operation (for correction) is fairly easy. To keep them open is difficult, however. If you cut out the skin or scars, you cause even more constriction."

Corrective rhinoplasty. This has been developed mainly since World War I, but the procedures were done as early as 1891.

Indications for corrective rhinoplasty. One function of the face is appearance, and the nose is the most prominent feature of the face. This function of appearance of the nose may be interfered with by distortion arising from trauma, racial, familial, or atavistic deformity, new growths, and other causes, and may be restored in many instances by corrective rhinoplastic surgery. This might be considered a surgical answer to a psychological problem, with an excellent percentage of recovery. The brief hospitalization required does not seem out of line in view of the vast hospitalization and expense involved in psychological problems without such an anatomic basis.

The old idea that the function of the nose was solely that of an air vent and sinus drain developed in the last century when little other nasal surgery was known. Surgeons seldom operated upon the nose at all; to them the nose was often just an obstacle to good access for surgery on the sinuses. Many patients, today, however, with crooked or deformed noses require something more than just to have an air shaft through the nose, and plastic surgical reconstruction can provide the best answer to their problems.

On the other hand, just because a deflected septum is to be removed is no reason that the contour of a nose should be altered, or that an attempt be made to improve an appearance which has not disturbed the patient. A physiological operation need not be an excuse for the correction of contour.

Corrective rhinoplasty can do a great deal for the essentially normal person who is reasonably well adjusted to his environment but just does not like a deformed nose. Corrective rhinoplasty will do little for the individual who is chronically unhappy or emotionally upset about many things; it will not cure a neurosis or psychosis.

These patients should be treated by a neuropsychiatrist, but final recommendation from him for operation should be carefully weighed by the plastic surgeon.

Contour anatomy is a term suggested to designate a definite function which is that of being normal in appearance. Although the nose encloses the airways and is used to breathe through, it is also the most prominent feature of the face, and deviations from normal may have to be restored to normal contour anatomy for the best function of the patient as a whole. This is most important in sensitive patients; their peace of mind may be restored by a surgical procedure, even though they have suffered for years and have not fully used their power of expression, especially in smiling, because a deformed nose is likely to look worse when the patient smiles.

Plastic surgery of the nose has advanced so far that it is possible to effect worthwhile surgical improvements in most nasal deformities. Perfection may not be attained, however, and it is best to explain this before operation.

Before undertaking this work, the surgeon's repertoire should include all of the best plastic surgical operative procedures. In addition, he must acquire adeptness in each minute precision in his operative technique, and an understanding of the viewpoints of patients with deformities. The development of these requires study, patience, persistence, and especially time.

These operations are major procedures from the patient's point of view and should be done with all the worth and dignity ascribed to any major operation. Levity about these deformities has been rampant, with the classic example of Cyrano, but the surgical approach and responsibility can be put on the level of any other procedure in the surgery of rehabilitation.

Implantations for dorsal line support. Human cartilage and bone are definitely the best materials known today for nasal transplants. Many different materials have been tried in the past including ivory, bakelite, polystyrenes, acrylics, vitallium, tantalum, gold, silver, and heterogenous bone and cartilage. Foreign materials usually are healed in primarily and may persist for several months or years, but eventually they may become the focus of an infection, or a prominent hard edge finally works through to the surface, inside or out, which results in their extrusion. The bed for nasal transplants is unique; the dorsal portion lies on cartilage and bone and is covered only with skin; the septal portion is covered only by mucosa on each side, which is so thin as to be almost transparent. The entire transplant and its bed are subject to frequent trauma, and to recurrent infections in the mucosa.

Heterogenous transplants have been tried by many surgeons and we may go back to the year 1892 for a typical picture of this type of processes. "At this period of the operation a young duck which had been chosen was killed, and its breast bone was cut into shape . . . and inserted. The restoration of the nose was remarkably satisfactory. Three weeks passed. The patient's delight was great, and mine was greater. Unluckily, soon after he complained of an increased discharge from his nose. At the end of the seventh week a swelling appeared at the root of the nose culminating in an abscess. . . In brief, at the end of eight weeks I felt that my procedure was not a success, and thought it was necessary to remove this foreign body." Although written in the nineteenth century, this is one of the most lucid descriptions of the usual fate of heterogenous and nonbiological transplants.

Bovine cartilage seems to be the most frequent suggestion, but most workers have found it unsuccessful and that violent extrusion frequently occurs.

The plastic materials that seem to promise the most hope of retention are acrylics, polyethylene, polyvinyl alcohol, and silicones.

Autogenous cartilage transplants. Autogenous cartilage will have less shrinkage than preserved cartilage and has more resistance to infection. It is readily obtained, but this adds to the postoperative discomfort of the patient. The main objection to fresh autogenous cartilage is its tendency to warp and curl, a feature from which preserved cartilage is free. This can be prevented by boiling it before transplantation, but it is then nonviable and possibly but little better than bank cartilage.

Preserved cartilage transplants. Preserved human rib homocartilage can be carved easily into the desired shape, does not produce reactions, has sufficient strength, and does not warp or curl. One can select from a cartilage bank a piece that is of the right size and shape and is relatively free of calcification. Disadvantages are that some pieces will shrink, in which case they may be replaced, if necessary; some may be absorbed and

may have little resistance to infection in the postoperative period. However, fresh autogenous cartilage and bone also may be absorbed, may float free from any solid attachment, and also may become infected.

Maintenance of a cartilage bank. Excess cartilage from other operations may be placed in the bank, but the chief source is from postmortem examinations of young adults free of any transmissible diseases.

The L-shaped cartilage transplant. For restoration of dorsal support a cartilage transplant should contain a dorsal and a septal segment. It seems better if these two segments are contained in one solid transplant in the shape of an L. Such a transplant can be carved from the angular portion of the sixth or seventh costal cartilage. It will rest on nasal bone and on the stump of the septum or nasal spine. The larger the septal portion, the less will be the tendency of the transplant to twist or slip.

Bone transplants. Bone can be used instead of cartilage and is favored by some workers. It can be put in as a simple cantilever dorsal segment, or with a columellar strut added, or with both pieces combined in a single L-shaped transplant. As with cartilage, the latter shape seems preferable for greatest support and stability.

Cortical bone has greater initial strength but cancellous bone makes the best transplant.

Treatment of saddle noses following septal resections. When too much of the septum is resected, the dorsum of the nose will cave in, even though the statement may be found that the septum has little to do with the dorsal line. This is a very objectionable deformity and requires an implant of some material to restore the dorsal contour.

Treatment of congenital retrusion of the nose and middle third of the face. These noses are extremely difficult to change, but many of them can be improved by a large, L-shaped cartilage transplant.

In addition to the main transplant, a crossbar transplant put in horizontally across the face will help in bringing forward the nostril bases and floors, as well as the adjacent cheek areas. This crossbar transplant can be done as a preliminary operation or at the time of the L-shaped transplant.

Early treatment of fractures and other acute injuries. Displacements of the nasal bones and cartilage are best replaced as soon as practicable after the injury. If there is a wait until swelling has subsided, partial consolidation will have taken place and the best opportunity for repair will have been missed. However, this does not mean that all fractures should be reduced at the place of the accident, in emergency rooms, or under other haphazard circumstances.

Secondary repairs of noses associated with single cleft lips. The appearance of the nose is important in patients with cleft lips, and should receive close attention in both the primary and secondary repairs. All of the procedures used in other osteoplastic repairs, and some specific procedures, may be needed in various patients with these deformities. The same careful preliminary study is necessary as for other nasal deformities.

Secondary repairs of noses associated with double cleft lips. Noses associated with double cleft lips may have all the deformities described for single clefts, except that they are double, bilateral, and more extreme. In addition to this, many of the patients have an extremely short columella, or almost no columella, and there is frequently little or no septal support, so that there is often a retruded nose with a tightly snubbed-down tip. When this deformity becomes apparent early, it may be best to elongate or reconstruct the columella at about 4 years of age, or later, to permit maximum forward growth of the tip, and still later a dorsal implantation may be needed.

Skin grafts to the nose. Free skin grafts are used for resurfacing part or all of the nose when the original skin has been destroyed or damaged. Such occurrences may result from burns, radiation dermatitis, traumatic losses, port wine stains, large nevi, and other superficial tumors. Pedicled flaps are used for restoring deep losses, but it is a mistake to use them when only resurfacing is required. Burned noses rarely require a flap repair.

Full thickness clavicular skin grafts to the nose. The best matches in color and texture are frequently obtained on the nose by the use of soft, pliable, full thickness grafts removed from the clavicular region.

Skin grafts inside the nose. Free skin grafts will take quite well inside the nose for replacement of lost mucosa or vestibular skin. However, in mucosal replacements, the grafts may secrete sebum and have a disagreeable odor, so that they should be avoided except when there is no other alternative.

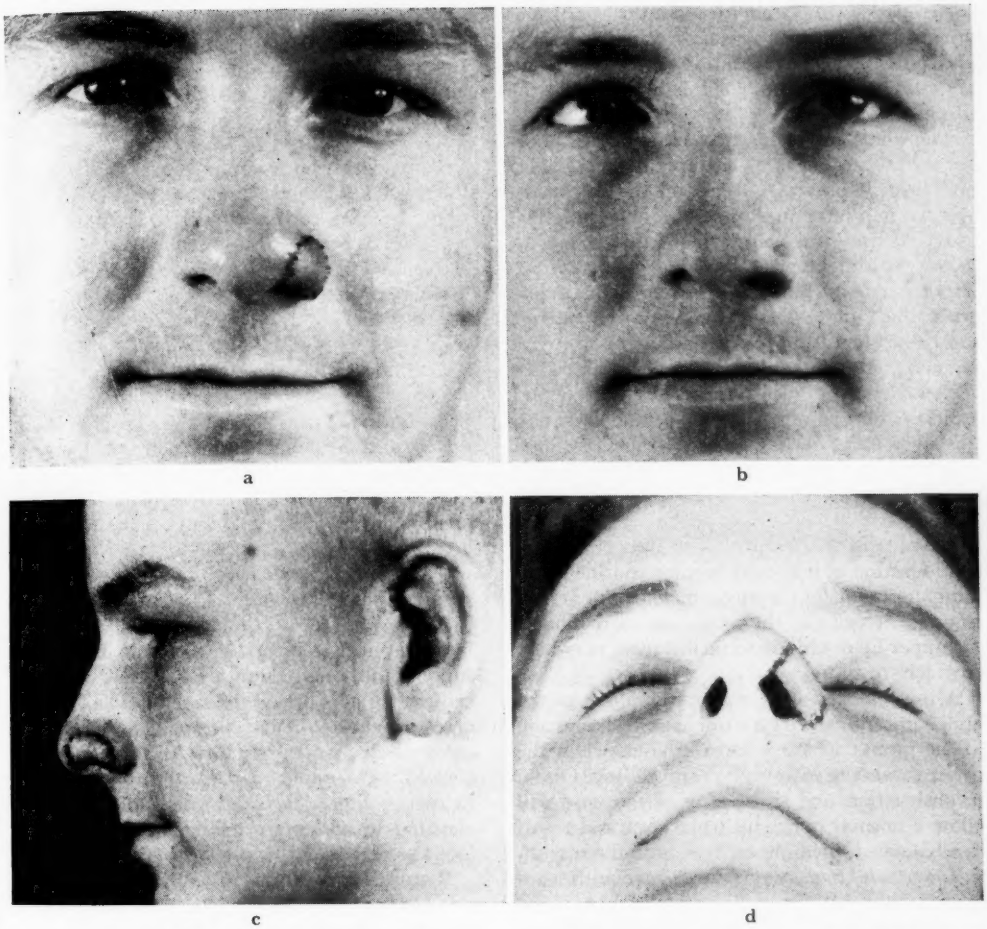


FIG. 1 a, b, c, and d. A composite graft from the ear is shown in replacement of the nasal ala. This graft is a free one of two surfaces of skin and the intervening cartilage taken from the helix or pinna of the ear as a free transplant and planted in one operation. With the use of this procedure there is a saving of many operations over a pedicled flap, and the most normal appearance is obtained.

Using free skin grafts in the nose is not comparable to using them in the mouth, because there is enough secretion in the mouth to keep them moist and they are not so inclined to develop odor.

Composite free grafts of skin and cartilage from the ear to the nose. Defects about the tip of the nose, the ala, and the columella are best repaired by free composite grafts of two surfaces of skin and intervening cartilage from the ear, or with one skin surface or part of the lobe when indicated. The repair often can be done in one procedure with the most normal appearance resulting from any method. There is minimal deformity of the donor site and the use of bulk flaps is avoided. The ear can be repaired locally or by burying the open ear under a direct skin flap from behind, then freeing it and closing the scalp donor area 2 to 3 weeks later.

The procedure is useful for tissue losses from trauma, burns, tumors, operative losses, and gunshot and shell fragment wounds. It is necessary that there be a satisfactory minute blood supply in the recipient area, and the defect has

to be opened widely and deeply over a sufficient area to arrive at the necessary minute blood supply. This enlarges the original defect somewhat, and allowance is made for this in designing the size of the graft.

The whole columella, tip, and one nostril border have been put in at one operation, and also both nostril borders. A great bulk of tissue, however, cannot be transplanted as a free graft. The usual maximum is a little more than 1 cm. in height with the length as long as necessary, the important point being to have no tissue in the graft much more than 1 cm. from its nearest source of blood supply. The apparent size may be increased if an extra amount of full thickness graft is taken up with the composite graft and attached to a suitable raw area, and although this idea had been advanced earlier, the first illustrations of successful transplants came during World War II.

The nose in relation to the upper lip and chin. Proper balance of the features is so important that consideration of it should become routine or almost automatic for the surgeon. The patient may complain chiefly of the nose, but correction of the upper lip or chin in some instances may help as much, or more.

A long hooked nose may cover much of the upper lip and impart an unpleasant expression to the mouth which is most obvious when the patient wants to look his best, in smiling. Often, reconstruction and shortening of the nose will allow a normal upper lip to be seen and result in a balanced, pleasing expression to the mouth.

The retruded chin. A very large nose with a retruded chin creates a "birdlike" appearance which is most objectionable to certain patients. If the chin is not too bad, reduction of the nose may be sufficient to soften the expression. The plans are worked out beforehand on a plaster cast, and the nose is corrected first.

The chin can be brought forward with a cartilage or bone graft, by a bilateral osteotomy of the rami and slipping the whole lower jaw forward, or by widening and deepening the lower labial sulcus with a split skin graft and inserting a dental prosthesis. The implantation of preserved cartilage is usually satisfactory.

The retruded upper jaw. One of the most difficult deformities is the retruded upper jaw with a "pinched-in" facies in the middle third. This may be associated with a degree of prognathism and nasal deformity. Considerable improvement can be effected by (1) correcting the nose, (2) setting back the jaw, (3) advancing the upper lip, and (4) implanting a crossbar of cartilage across and behind the lower end of the nose.

Facial Paralysis

Paralysis of the seventh nerve presents one of the most difficult problems, and procedures in plastic surgery for such patients are considered when there is thought to be no chance of nerve recovery or of nerve operation. They also may be useful to support the face during a waiting period in the process of nerve recovery or of neurosurgical work.

The finely kinetic actions of the muscles supplied by the seventh nerve, such as the gentle approximation of the eyelid to the globe, awake or asleep, and the delicate movements of emotional expression, hardly can be expected to be normally restored by the substitution of a few points of suspension with fascial loops or muscle flaps; and, therefore, as in much of plastic surgery when missing parts have to be supplied, a substitution has to be made.

The use of fresh autogenous strips of fascia lata continues to be one of the basic methods of support, although there are several other procedures for supporting the face with various degrees of efficacy being obtainable. These strips are anchored in the temporal (fifth nerve) muscle and fascia, and looped down through the face in two or more levels. The bulk of the face is elevated to an overcorrected position and the loops are anchored securely.

Reanimation or movement of the paralyzed side is possible by pull of the temporal muscle, but not too much is desirable because of its being noted too much on eating. But this movement is advantageous, and with a little effort many patients can substitute it for a little emotional expression, a smile, and for improved eating.

Excision of excess skin can be done preferably before or after the fascial transplant operation.

Improvement in comfort of the eye is one of the main objectives.

Flaps brought down from the temporal muscle and forward from the masseter from the opposite frontalis have been used with success.

Wires have been used but are mentioned here only because of their generally not being successful. Strips of fresh autotransplants of fascia lata can be obtained so simply that there is little reason for not using this medium for support.

a b

FIG. 2 a and b. Facial paralysis with support and some reanimation obtained by fascial slings implanted through face into the temporal muscle, thus substituting action of the fifth nerve for that of lost seventh nerve.

Ptosis of the Upper Lid

Several procedures have been developed for this. Ophthalmologists usually prefer an intraocular procedure, depending on any remnant of levator action or on the superior rectus. Plastic surgery procedures which may be employed by consultant ophthalmologists usually depend on some adaptation of extraorbital attachment of the tarsal border to the frontalis with fresh fascial strips. Here again foreign material seems distinctly inferior to the use of these autografts of fascia.

Facial Hemiatrophy

For this unpleasant, unsightly, and difficult situation many procedures have been suggested, including dermal, fat, and fascial free grafts, huge flaps, and synthetic prosthetic fillers.

Some worthwhile improvement has been obtained in filling these unsightly defects, but the problem of trying to maintain sensation and expression and even blood supply remains. Letting loose any contracted mucosa also is important as well as actual excision of grooves in the forehead. This is one of the worst challenges to plastic surgery that remains as unsolved as its etiology. Finding a suitable soft subcutaneous filler such as a silicone may prove to be the best answer.

Elevation of Sagged Facial Tissues

Worthwhile results can usually be effected in single operations by proper opening, undermining, elevation, and fixation to the scalp of the face and neck skin. The eyelids require separate operations and, in respect to the lower lids, proper decision as to whether the trouble is redundant skin or protruding fat. These procedures are major ones and require the skill and understanding necessary for any major surgical procedure.

Each operator has his own interpretation of these procedures but there is no known way to effect much worthwhile relief by small local operations. Scars are not left prominent, hair lines are preserved, though somewhat displaced, and, needless to say, the seventh nerve is left intact.

Prognathism

Ramisection of the horizontal ramus of the lower jaw is an established procedure for advancing the lower jaw in microganthus and for recessing it in prognathism, and is used occasionally for ankylosis and in cleft lip and palate

deformities either with or without actual prognathism. When the patients are not suited for orthodontic expansion of the upper arch, then the lower jaw can be recessed to proper proportion with the upper so that an external balance of appearance is obtained. If the upper arch is not too small, functional occlusion with improved mastication also may be obtained.

Various surgeons have been credited for first sectioning the rami and several methods have been described, the extraoral route being generally accepted over the intraoral route. Chisels, saws, and drills have been used, saws being relied on usually. The route through the bone is from underneath with a Gigli saw carried through with a large hook, from the outer surface of the bone inward with a saw, or by turning up the soft tissue and using multiple drill holes.

The operation is not a simple one in its execution, or in its anatomical details of the seventh nerve, the parotid gland and blood vessel association, so that it is considered a major surgical procedure, and should be undertaken only as such. Close co-operation with the dental profession is required in this as in many other procedures about the jaws.

In this deformity the chin itself may slope forward so that still further reduction is done by excising the forward protrusion of the bone. Resection along the body in the molar region is sometimes required.

Microganthia

This is almost the reverse of prognathism and the procedures for correction are more complicated because here there is not enough to work with instead of there being too much, as in prognathism. The chin is usually built forward with cartilage, bone, or inert prosthetic material. However, if there is enough ramus to deal with, a ramisection and forward positioning is done. Occasionally a shiplap in the body of the jaw is relied on.

Subcutaneous Prostheses

Deformities and abnormal contour anatomy, resulting from loss and distortion of bone, soft tissue, and cartilage, present a major problem in plastic and maxillofacial surgery, and the development of satisfactory subcutaneous prostheses is one of the greatest needs. The wide variety of substances, homogeneous, heterogeneous, foreign organic, metallic, and synthetic, that have been used in the attempt to improve these defects is an indication that search for more satisfactory replacements should be continued. All subcutaneous prostheses should be inert in the tissue, light, resilient, have ease of workability, and should not produce tumor. Preferably, there should be prostheses of soft yielding consistency and also ones of rigid stability that would become fixed to bone.

Establishing a Preserved Cartilage Bank

In plastic surgery the problem of reconstructing features and contours that have been lost or are congenitally deficient frequently arises. Suitable soft tissue restoration has to be made with the patient's own tissue, but the support (or armature) such as that required for a nose, ear, or orbital border may be supplied from a stock source of preserved human cartilage. Fresh autogenous tissues have advantages, but in a large series of patients it may not be expedient to open the thorax in every one, the costal cartilage being the main source of supply.

The list of substances which have been used in filling out contours includes such things as ivory, steel, gold, silver, tantalum, paraffin, rubber, wood, bone, glass, and plastic. It is probable that cartilage fulfills the qualifications better than any other substance and is acceptable in the largest number of cases.

Cartilage may be divided into three groups according to its sources:

1. Autocartilage—that obtained from the same individual.
2. Homocartilage—that obtained from another individual of the same species.
3. Heterocartilage—that obtained from a different species.

The third group probably can be omitted as a type for successful implantation because these transplants are apt to be discharged rather violently.

Hyaline cartilage has the widest variety of uses because of its availability in large quantities from the costal cartilages, but the elastic and fibrous types of cartilage have been implanted successfully.

The advantages of preserved homocartilage are:

1. Its procurement does not require a major surgical procedure involving additional operating time and risk.
2. It is available in the quantity desired.

3. The quality and shape of cartilage needed is available.

4. It maintains the shape in which it is inserted. The tendency of fresh autocartilage to curl has ruined many a result that looked perfect at the time of operation. Some curling in the cartilage used in the ears is not objectionable if it can be planned for the curling to be outward from the skull. The tendency of homogenous cartilage to curl or warp is spent during the period of preservation, unless it is used when fresh.

5. Because of availability it can be used as a temporary prosthesis or as a pattern for the later permanent implant.

6. Sliced, chipped, diced, and grated cartilage may be prepared from this preserved material and used as desired.

The disadvantages of preserved homocartilage are that there is more likelihood of absorption than of fresh autotransplants or homotransplants, and it may not be esthetic to a patient to have foreign cartilage implanted.

On a large plastic service it is advisable to have on hand a large supply of preserved cartilage. This is kept in the form of a cartilage bank. The steps in the establishment of such a cartilage bank are:

1. Procuring the cartilage
2. Cleaning and preparing the cartilage for storage
3. Selecting a suitable preservation
4. Maintaining a system of storage and bacteriological study.

Procuring the cartilage may seem an insurmountable task, but perseverance and co-operation with a pathology department are requisite.

Polyvinyl Alcohol and Silicone Compounds

It has been found in laboratory animals and clinically that foamed polyvinyl alcohol sponge might be a satisfactory subcutaneous prosthesis for use just under the skin, presumably not causing tumor formation; however, tumors or breakdown might occur later in clinical use than is observed in laboratory animals, and further investigation is needed before a final decision is made. Implanting large amounts of this material to fill out the breast contour, as reported in a popular magazine, has resulted in trouble according to reports from physicians doing follow-up care on these patients.

Various silicone compounds have been implanted subcutaneously in experimental work, but no reaction has been noted and no tumor formation has been evident in the animals through a full life cycle. Work is under way for the development of polymers of various consistencies, with the hope that an injectable one may be developed; work is also under way with a similar group of compounds, the fluorocarbons.

Success in plastic surgery will depend on the availability of an adequate pocket to receive the transplant and permanent healing over it; here again, as has been repeatedly noted, the deep healing can be no better than the surface healing, and in the instance of an unsuccessful subcutaneous prosthesis the surface healing, contour, and resiliency can be no better than the deep healing.

As to the rigid metals and other synthetics for prostheses, gold tantalum, stainless steel, acrylics, and polyethylene have all been used and recommended without a final decision so far as to which may be the best.

Cleft Lip

There are many claims and counter-claims in the literature on this subject that require careful consideration before arriving at one's own idea of what may be best.

It is generally conceded that some form of a flap operation supersedes a straight (or curved) line closure, and basic operations from the last century with modifications are relied on generally and practically each operator's interpretation is the final answer. Double lips are about twice as difficult and the results are about one-half as normal as in single lips. One pitfall throughout the literature is the reporting of results at too early an age for final evaluation, and another is the disposal of the important details of the nose and nostril floor. The marking of the lip reconstruction has taken perhaps too much precedence without enough attention to the concomitant problem of the nose. One book on the subject completely divided the lip and the nostril problems so as to be somewhat difficult to follow.

Whether to close the front part of the palate at the time of the lip closure or not occupies a good deal of discussion with advocates of the anterior closure being quite certain that it is important, but with others not finding universal success in wide clefts but finding interference or the loss of tooth buds.

This problem continues to be one of the most difficult in all of surgery if we are to judge by

results, but excellent progress is being made and very worthwhile results are routinely forthcoming.

Cleft Palate

In the repair of cleft palates one goal should be to obtain the best possible function of the soft palate. This will require pliable tissue, sufficiently long to meet the posterior wall of the pharynx (Passavant's pad) in the sphincterlike action of this region that closes the opening between the nose and throat. Although operations may be well executed and the palates may appear normal after operation, perfect speech may not be obtained. This persistent speech defect is probably due to a leak of air into the nose which may occur if there is an opening of only 1 mm. left.

In efforts to insure complete closure, methods have been described for gaining length in the palate, or for carrying the posterior pharyngeal wall forward.

Elongations have been done by freshening the edges of the posterior pillars, detaching them low down in the pharynx and then suturing them together in the midline, thus extending the palate behind the uvula; however, tissue that is normally a tensor of the palate is changed around so that the levators try to pull it up in closure of the opening and a scar pull in the wrong direction results. Rectangular flaps from the cheeks across the palate after it has been dissected backward is somewhat formidable for the gain involved. A backward dissection of the palate with an apparatus to hold a skin graft on the raw surface, the resultant opening into the nose in the front part to be closed by an obturator, has been described.

Some think that in complete clefts an operation of the Dieffenbach principle may be executed to allow a backward move of the entire palate, but if any great displacement takes place, a hole persists in the front part of the palate. Others have even sacrificed the closure in front in order to have the tissue available posteriorly and have then used obturators for the anterior opening or have brought in flaps from a distance.

After closure of the palate, several surgeons have directed their attention to carrying the posterior pharyngeal wall forward by reefing it forward by means of a submucosal prosthesis and rectangular mucous flaps dissected free from the pharynx and attached to the soft palate.

Palates that are cleft only through the soft tissue or on up, part way through the bone, may have actually less tissue for repair of the soft palate than those with complete clefts, and there are also patients with uncleft palates that are so abnormally short that speech is just as bad as though the palate were cleft. This has been called "congenital insufficiency of the palate." It is in this group that the most direct attempts have been made for actually lengthening the palate by moving the whole of the soft tissues backward and still have the bony palate in front to separate the nose and the mouth. The "push-back operation" is probably the best known. The essentials are that a delayed flap of the entire covering of the bony palate is made except that the major palatine arteries are sacrificed. At a later operation the mucoperiosteum is again raised from the bone and the whole mass is "pushed back" so that the anterior edge of the flap may be anchored as far back as the posterior bony edge. The cleft is closed and the anterior denuded bone is left to heal over.

Elongation of the partially cleft palate may be done with a direct flap of practically the entire palate which is raised completely free from the bone and is immediately set back so that the anterior free edge is anchored clear back at the posterior edge of the bone. The major palatine arteries are definitely preserved and left to supply the palate flap. The palate is allowed to heal here, the bony palate to cover completely with epithelium. The palate cleft itself is closed at this procedure or later.

The ideal for a child with a single cleft lip and cleft palate is one operation on the lip as soon after birth as convenient and one operation on the palate from the second to the fourth or fifth year. With good planning and execution and good fortune in healing this should be the basic surgical requirement for one of these unfortunate children.

They all need the usual general pediatric care and special care of their general dentistry to save all teeth possible. Most of them need orthodontia to widen and bring forward the arch, or for the same reasons as children without clefts. They may later need prosthetic appliances across defects in the dental arch so that chewing, appearance, and speech may be improved. Many of these patients need speech training in private or in class and at home by their mothers. Some patients speak well with obviously open or only

partly closed nasopharynges, while others continue to have trouble with normal-appearing palates.

These children and their parents may need psychiatric guidance, again the same as any family might, but it is always pleasing to note that these patients frequently excel in school work and in adjustment to getting around in life.

Almost needless to say, they require ear, nose, and throat care and audiograms as indicated.

The problem is a complicated one in which the plastic surgeon, pediatrician, general dentist, orthodontist, prosthodontist, speech therapist, otologist, and psychiatrist may all have a part to play. The most lacking to date are perhaps the dental considerations to save the teeth and the orthodontic and prosthodontic care to realign and substitute teeth.

This combined need has been recognized and filled for many years in many services, and recently there has been a new urge to supply these patients with these various services.

Obturators and speech aids have been advocated over a period of many years, with numerous modifications of appliances that are attached to dental plates. In the last few years there have been acrylic extensions that are carried backward to meet the superior constrictor of the pharynx in speech, and these have proved invaluable in insufficiencies of the palate tissue and in badly scarred palates and soft palates that have no chance in closing the nasopharynx in speech. Most of the badly scarred and crippled palates have come from occasional operators, or have been dependent on a bone collapsing operation that was the subject of an entire book written many years ago from a dental viewpoint. Another operation that produced a fairly long but often unclosable palate was the one in which the uvula was disregarded and the posterior pillars were sewed up after they were divided transversely low down in the pharynx, as was mentioned previously.

It is noted that a good many recommendations for cleft palate obturators are made on the observation of poorly repaired palates, and while the patients all need care and are greatly benefited by prostheses and speech aids and obturators, it seems more to the point to try to get the basis of care established on a single operation for the lip and a single operation for the palate and carry on from there with orthodontic and prosthetic restoration as needed, with good surgical results as the standard rather than poor or crippled palates.

Needless to say, the patients are potential cripples in life and need guiding care and surgery for their best establishment.

Ear Reconstruction

This type of work for congenital absence, or traumatic and burn losses of the ear continues to present one of the most difficult problems in plastic surgery and few final results have been shown. It may be recognized in this field that substitution is the best process that can be offered and that completely normal-looking ears are not forthcoming. The problem seems so difficult that methods are described but finished ears are not illustrated, and prosthetic ears have been resorted to in many instances. Prosthetic ears may look more natural than a heavy outline of an ear from surgical reconstruction but they have the drawbacks of requiring constant attention and of not staying in place.

However, good progress has been made even in the recognition that all the definitive folds and curves of a normal ear cannot be reproduced and the making of an acceptable outline came to the fore with the result that many surgically reconstructed external ears are not noticed at a distance of a few feet, and many patients adjust to satisfaction with this state. This basic decision changes the procedure to from 3 to 6 operations, with local tissues and grafts, cartilage, and possibly a small neck flap, instead of, as formerly, large neck and chest flaps and tedious shifts that were reported as requiring as many as 30 operations and 10 to 12 years for completion. Much of this change came from World War II experience in dealing with many burn losses of ears.

Ear canal opening in the patients with congenitally absent canals has had recent impetus, but the opening may not look normal and it may be considered that it can be omitted unless there is a crippling loss of hearing (as when both ears may be absent).

For support of the surgical ear many prosthetic materials have been advocated, fresh autogenous and homogenous cartilage, or preserved cartilage in one piece or in a delayed mold. Synthetics have not had wide acceptance so far; ox cartilage has been tried but not found satisfactory. Fresh ear cartilage from the mother has been suggested from time to time, but this leaves a crippled ear in the mother.

Large or *prominent ears* have been reported as being successfully repositioned by many authors, and this is one of the most satisfactory procedures in contrast to rebuilding. The operation is important from the patient's viewpoint and many times may be considered as necessary.

Tattooing

Permanent pigment injection has had various advocates for matching grafts and flaps with other exposed surfaces, for simulating vermilion borders, for portwine stains, and probably it was first used for corneal scars. However, it has not held up in original promise, mainly because of absorption of the pigment. (One may recall that one of the European rulers who has many tattoos for his own esthetic reasons has to have them done over every few years because of fading.) The procedure, however, needs further investigation and use because some of the worst faults of facial restoration are unavoidable differences in color.

Abrasion of Scars

The use of sandpaper, knife, and steel brushes on motors for the abrasion of scars, including those of acne, is at present being advocated more from a dermatological standpoint than a surgical one. Its efficacy is varied, as in any procedure, but here again further work and trial is needed and if gains can be made in the alleviation of irregular surface scars, another fine advance will have been made.

Scars and Keloids

These lesions continue to occupy front rank place in investigation and trial. Hyaluronidase, cortisone, and testosterone have been used with various reports. Radiation continues to relieve some inflammation and possibly makes some improvement but it must be guarded carefully. Work on diet content and growth factors may be of the most basic worth, but so far the problem is wide open for solution. Needless to say, many distorted scars are improved by surgical revision, but when it is claimed that scars can be "removed," the healing process must not be well understood or perhaps it is held in abeyance.

Elephantiasis

This condition has been reduced mainly by the excision and grafting of the extremity involved. Tubed flaps have been carried to the lower extremity from the abdomen across the inguinal region and sometimes via the arm. They have not proved successful in enough reports to warrant their use thus far.

Lymphatics

These vessels continue to offer few revealing facts, but studies concerning them in the basic sciences, as well as by plastic surgeons, may lead to the basic relief of scars, elephantiasis, leg ulcers, and other disturbances of this system.

Facial Burns, Skin Replacement, and Scar Removal

These have been the subject of many reports. Excision and drawing together of resultant wounds after wide undermining has been useful in many lesions, but may interfere with the nerve supply and emotional expression so that the patient may feel marked discomfort and distortion on movement and seek further relief. The eyelids may be pulled away from the globe and the mouth pulled open to a point of leakage. Such extensive losses obviously need more skin such as free grafts or flaps, and these have been advocated and reported repeatedly in the literature.

Supraclavicular Grafts

These have been found to give perhaps the best skin match in color and function, but the supply is limited. Skin from below the breast seems the next best match, with the inguinal region next.

Eyelid Replacements

These were needed in great numbers in World War II and the supraclavicular skin or skin from the ear region was used. Reports of setting excessive-sized grafts and then trimming all the edges vary with those of setting grafts in with fine edges and no trimming later.

Full Facial Skin Replacement

This is sometimes necessary, but the consensus of opinion is that it is best done in stages. The full procedure at one time has been suggested and even diagramed in the literature, but with no final illustration of a successfully completed patient. This would be a procedure of excessive magnitude, and in this objective summary a sentence may be taken to call attention to the dangers involved since these are not sufficiently stressed in the reports advocating it.

Scalp and Skull Losses

Plastic surgical restoration of these losses have often been reported, rotated flaps being used when possible or distant flaps being brought in on the arm as a carrier when needed. The bone defect when presented to plastic surgeons for restoration has most often been replaced with fresh autografts, but many metal and synthetic plates have been put in place by neurosurgeons with success. These bone replacements, however, require a sufficient superficial covering and this has been another chance for close co-operation of various surgical services.

Carcinoma and Tumors About the Face, Head, and Neck

These conditions fall into the field of plastic surgery naturally because of the difficult problems of reconstruction, and many reports of these lesions come from this field of work. Plastic surgeons have been thought of as perhaps overenergetic in getting tumor areas closed, but they also know that many of the areas involved actually do better left open to reconstitute their own defects as far as possible naturally, to be followed by secondary reconstruction. This also gives more time for observation of recurrence of the growth, as may happen right through a laboriously reconstructed area if the removal procedure has not been done outside of the tumor field.

Severe Injuries of the Face and Jaws

These injuries have been the subject of innumerable articles. Severe blows about the face may produce extensive fractures with only contusions on the surface, and, conversely, widespread soft tissue lacerations may not be complicated by fractures. However, the two occur together so often that the care of the soft parts and of the bone cannot be separated. If it is assumed that fractures can be considered and cared for after swelling has occurred and subsided, the best chance for correct bone replacement is missed. Simple procedures for bone replacement and fixation usually suffice and special splints are seldom required. It is important to have someone on hand who understands the dental requirements, because one of the most important functions to maintain is mastication, and this requires that the teeth occlude naturally.

Skull fracture and brain injury, damage to the cervical spine, and lesions of the orbit and the eye itself are very frequent and always should be looked for, recorded, and treated as indicated.

The primary repair should be done as soon as the patient's general condition permits and in the first 20 hours if possible, before swelling, organization of clots, and infection have occurred.

Meticulous cleansing should constitute almost the entire débridement. The usual plan of wide excision of all torn edges should not be practiced in the face. Conservatism should also be the rule in dealing with loose bone chips, as it is probably better to leave in some bone fragments that might die than to needlessly discard any good supporting fragments that might live.

There is almost complete accord among surgeons as to the principles mentioned for the patient's best chance, which include early evacuation and early operation.

Internal Wire Pin Immobilization of Jaw Fractures

Varied methods of treating complicated and compound jaw fractures occur in the literature, and stem to a large extent from the World Wars. From one foreign country a group of reprints about 6 inches high is available. These methods include open bite splints, overhead plaster-cap traction devices, complicated dental appliances, and external fixation.

The variations of technique of interdental fixation are numerous and all are efficacious. These include continuous loop wiring, eyelet wiring, button wiring, elastic loop fixation and acrylic splinting, all of which have been adequately described. Cap splints with either open or closed bite and with immediate or delayed rubber traction reduction were used extensively in both World Wars, especially in foreign countries, and also acrylic and gold splints have been used to good advantage. Whatever will give the best fixation is, of course, the ideal, and no one single procedure is applicable to all patients. This might lead one to believe that there is no uncomplicated solution; however, internal wire fixation is a direct approach applicable to the problem of fractured jaw immobilization that can be resorted to in many instances.

When, for some reason, interdental wiring or other fixation would not be sufficient, the fractured lower jaw can be immobilized with a Kirschner wire (.05 to .08 inch) driven across the fracture site. Among the numerous indications for which this method has been frequently used are lack of available teeth, symphysis frac-

tures, fractures at the angle with the posterior fragment displaced into the upper buccal fornix, and when there is tearing and displacement into the mouth.

Middle Third Facial Fractures

In the stabilization of crushing fractures of the middle third of the face, internal wire-pin fixation may give excellent help. It may be used in combination with direct wiring of the zygoma to the frontal bone, through-and-through wiring fixation of the nose, interdental wiring, open elevation of the orbital borders, and with most other procedures. The internal wire in itself may suffice, except that elevation of the crushed nose and support of it on crossed wires are usually necessary in instances of badly comminuted fractures. In the presence of pyramidal fractures going through the orbital borders and possibly separating the inner canthi, these areas are replaced, if possible, by elevation, compression, and molding before the internal wire is placed.

Shortening of the middle third. In bringing forward the face and in elevating the orbital borders the procedures are important in relation to the frequently described necessity of elevating the upper jaw in transverse facial fractures. Elevation with overhead traction apparatus and through-the-cheek wire from the dental arch are not indicated as frequently or as actively as is sometimes reported, because many transverse facial fractures are already too high and need to be brought down instead of up. The egg shell maxilla and antra may collapse and be jammed upward on themselves instead of coming apart and elongating downward. This condition is seen in traffic accidents in which the jaw strikes the steering wheel or when the lower jaw jams the upper from below. In any event, it is apparent that elevation toward the vertex may be overdone with too much traction, and a permanent deformity may result.

When this method can be used in place of expensive cumbersome apparatus, the saving may be considerable in equipment, hospitalization, and in the patient's comfort and period of disability.

Bone Grafts

In gunshot wounds and other injuries in which there are large losses of substance about the face and mandible, there are the essential problems of reconstruction of the soft parts and of bridging the gap in the jaw with a bone graft. The objects of surgical rehabilitation are a watertight mouth, a chance of function of the jaws, restoration of speech, and the production of the most normal-looking contour anatomy.

In rebuilding the lower third of the face, including the bone and soft parts, the process has to be in reverse order of the usual plans of mechanical construction. In a building the support is put in first and then the walls are added, whereas in plastic surgery reconstruction, the support has to be put in underneath the covering, possibly comparing the construction to that of a tent rather than that of a solid building. Although the bone graft may eventually hold the soft parts where they belong, the soft parts must be present in adequate amount and supply adequate minute blood supply for the bone graft to take and persist, and this is a basic requirement. This may be obtained by resection of the whole scarred area and the substitution of a permanent pedicled blood-carrying flap in the area brought up from lower down on the neck.

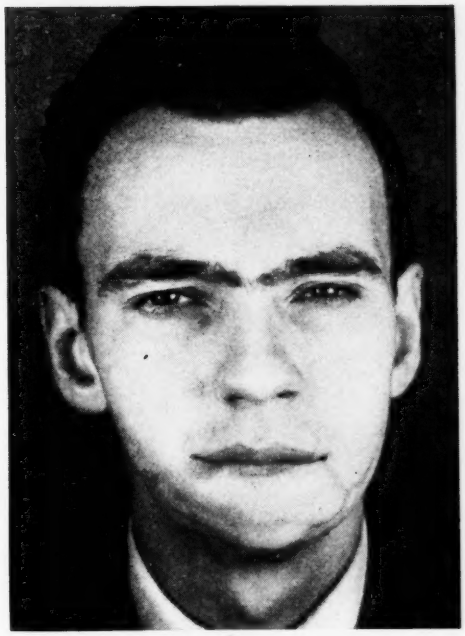
Persistence of the bone graft is dependent on a suitable bed of soft tissue and an adequate minute blood supply, and also on a completely healed wound without infection or tracts leading into the mouth or to the outside surface.

Bridging a gap in a bone is a much more extensive and difficult procedure than holding two ununited fragments together until healing has occurred, and the bridge of bone in large gaps of the mandible is what is necessary if the remaining fragments are to be aligned and any degree of function and normal appearance is to be obtained.

Permanent persistence of these large long bone grafts, as such, is thought to be the situation in these bridges of bone. Although they may gradually be replaced in metabolic processes, they do not seem to be absorbed or replaced with bone from the ends of fragments. The wire fixation and the size and shape of these long bone grafts are retained after many years on x-ray examination and it is probable that they are true grafts, persisting as skin grafts do.

Artificial subcutaneous prostheses of metal or plastic, chipped bone grafts with or without metal trays, foreign bone grafts, fresh homografts, preserved animal grafts, or grafts from human bone banks have been reported frequently but have not been observed in an adequate enough series to be relied on as substitutes for

a



b

c

d

FIG. 3 a, b, c, d. This patient, cared for at Valley Forge General Hospital, may be taken as an example of numerous needs and procedures in reconstructive surgery. He illustrates (1) what may happen in war (or a civilian injury) in the loss of the lower one-third of the face and of the jaw, (2) the method of reconstruction, (3) his own rehabilitation as seen in his expression and in his success in life regardless of his tremendous injury, (4) co-operation of many echelons of care, starting with the tracheotomy done in the Canal Zone and going through the team work of plastic surgeons, dentists, neuropsychiatrists, and internists, (5) the use of a flat (nontubed) lined pedicled flap, (6) careful transfer and approximation to the face, (7) split graft repair of the donor site, and (8) replacement of the jaw with a free autogenous bone graft that is shown on a roentgenogram, intact 9 years later.

a b

FIG. 4.

the solid, fresh autograft used in these large permanent bridges at present.

Internal wire pins or steel bars from fragment to fragment for support of a gap were first used in the immediate repair of a wide bone loss and may be used at the time of original treatment or in jaw resections for tumor. However, the final repair, especially in a young patient, is thought to be best with a fresh autogenous bone graft that he can call his own and depend on.

In extensive losses of the lower third, including both soft tissue and bone, the *preliminary soft tissue preparation* and replacement is done before the bone graft is put in.

Flaps

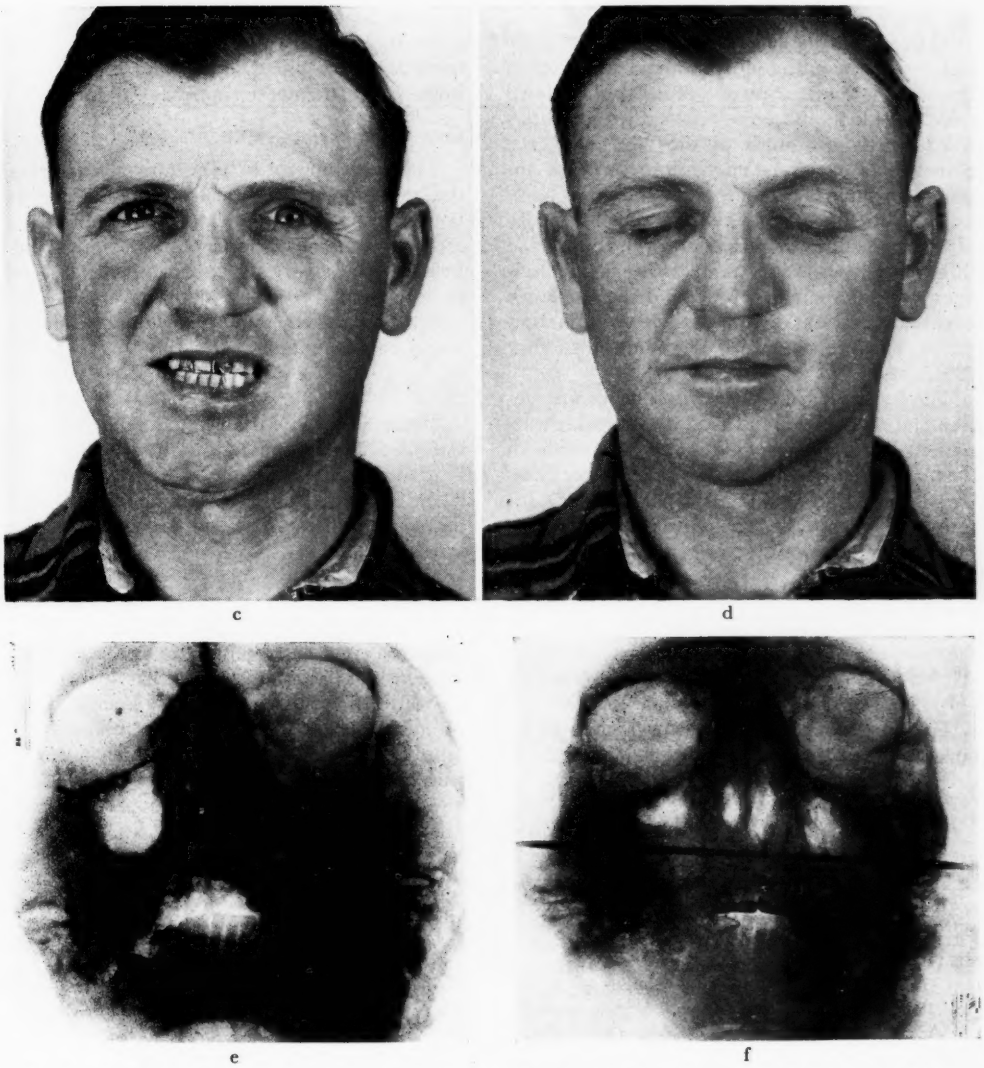
For the repair of the soft tissues, flaps are designed according to the extent of loss and of scarring. Local flaps, as in all plastic surgery, can be considered but are not used for very large losses as they might result in further scarring and collapse of the fragments of the remaining jaw. Rather than this, it is better to fill the defect with soft tissue from a distance and let the bone fragments separate to the original normal positions.

A permanent pedicled blood-carrying flap can be brought up from lower in the neck and the pedicles left intact so there is a new blood supply to the area brought in permanently by the flap. This flap is used if there is not a very wide loss of tissue. The usual flap is somewhat of a drain on the blood supply of the area when the pedicles have to be divided.

Distant delayed pedicled flaps are brought up from the chest when there is a large loss. They have to be lined if there is not enough mucosa available, and the lining is turned in as a secondary flap or supplied as a thick-split graft under the pedicle when it is first raised. Flat flaps are usually relied on but the pedicles can be tubed if this will make shifting easier.

Tongue fixation

Such fixation out on the neck should be freed and mobilized before the flap or bone graft is done or the tongue may never be gotten free. Usually the scar can be resected and the tongue loosened to go back into place. The defect can be covered with a free graft, preferably a full-thickness one from above the clavicle, to give the best



c d e f

FIG. 4, a, b, c, d, e, and f. Early repair of extensive crush injury of the middle third of the face by "doing the reverse of what the accident did"—replacing the fragments and holding them with the cantilever support of a wire pin clear through the face from a solid place on the opposite side. In this manner diplopia is prevented and the soft tissue tears are repaired. One early operation.

function and softness, or with small local flaps. If there is extensive loss of tongue, there is all the more reason to try to get it as free as possible, as speech with a fixed stump may be very difficult.

Salivary flow out onto the chest has to be stopped before the bone grafting, and if there is no wide loss, the first consideration is to mobilize lateral flaps and close the floor so the saliva will go back down the throat instead of out on the chest.

Excision of the scars and closure in stages has almost no place in this type of injury. It collapses

the fragments, fixes the tongue, and may leave the saliva pouring out. A good deal of difficulty has been encountered (mouths being pulled open and saliva pouring out, eyelids pulled down from the globe and emotional expression interfered with) in wounds of the face when the principle of excision and closure has been applied to wounds of too great an extent.

The patients fortunately suffer but little pain at the moment of the accident, even though the fifth nerve roots are torn out. However, there is agony and despair to follow, and the challenge of surgical restoration and of their own rehabilitation is one of the most demanding in surgery of this type.

The final criterion of the result of reconstruction and rehabilitation is the extent to which the patient is able to resume his normal station in life and carry out his usual activities without embarrassment in regard to his appearance or limitation in his motions. This optimum goal seems to be a high one, but it can be attained surprisingly often by sufficient persistence on the part of the surgeon and others caring for the patient, along with the co-operation of the patient himself.

MISCELLANEOUS LESIONS

Hand and Forearm Repairs

These present a huge subject which is to be covered by Doctor Mason's review in this series.

Lower Leg and Foot Lesions

These lesions have been seen to come into great importance in plastic surgery, and, as with the upper extremity, the position of the plastic surgeon has been to save every extremity possible. Such a course is always decided on if there is an adequate blood supply and is even more important if the nerve supply is still intact.

Cross Leg Flaps

These are thought to be best taken from above the knee, and if the lower leg is used, great care is needed not to complicate the process with a second crippling deformity. These flaps should be delayed if a very short, broad pedicle cannot be relied on. Cross sole flaps have been sporadically reported, but here again much trouble might be encountered.

Sole Defects

These are treated with free grafts by most authors if there is enough natural pad over the bone and tendon to give sufficient protection. These have been used as temporary or trial measures with the cross leg flap being held for later decision.

Leg Ulcers

These ulcers continue to be severe problems while the vessels and lymphatic drainage as well as the general anatomy are still trying to catch up with the upright position. Excision deep enough to arrive at an adequate minute blood supply and to get beneath the area of absent lymphatics and calcium deposits followed by free grafting is a continual problem. This is made still more difficult in many instances by excessive radiation and long continued efforts at healing with the additional scarring and lymphatic loss.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

A Method for Partial and Total Upper Lid Reconstruction. NORMAN L. CUTLER and CROWELL BEARD. *Am. J. Ophth.*, 1955, 39: 1.

THE AUTHORS present a two-stage method of partial or total reconstruction of the upper eyelid for cases in which the insertion of the levator muscle is intact. The procedure is useful whether the eyeball is present or absent because the skin and mucous membrane are carried in one flap.

After a wide excision of a tumor mass in the upper eyelid or, in traumatic or congenital cases, after freshening of any epithelialized areas, the defect in the eyelid is fashioned in a rectangular shape by two vertical incisions and a joining horizontal one. The entire tarsus and eyelid tissue, well up into the fornix, may be removed if necessary. A horizontal incision is then made through the full thickness of the lower eyelid just below the inferior border of the tarsus, parallel to and approximately as long as the horizontal aspect of the defect in the upper eyelid. From the two ends of the horizontal incision in the lower eyelid, vertical cuts are made through the full thickness down to the lowest point in the inferior fornix. The conjunctiva, muscle, and skin of the rectangular flap thus formed remains connected at its upper edge by connective tissue. Through the vertical cuts, the skin of the base of the flap is undermined well down onto the cheek, enabling the flap to be freely mobilized. The conjunctiva is also undermined and freed.

The corners at the upper edge of the flap are fixed by means of silk traction sutures, carried beneath the undisturbed portion of the lower eyelid which now forms a bridge. The flap is stretched upward behind this bridge and is sutured into the defect in the upper eyelid in two layers as follows:

Continuous No. 6–0 silk sutures are used to fix the conjunctival layer, the free ends of which are brought out through the skin and locked. Interrupted silk sutures are used for the skin. The raw edge of the bridge is closed by interrupted sutures joining the conjunctiva and skin.

After 5 or 6 days the dressing is changed and alternate skin sutures are removed.

In 3 or 4 days more, the remaining skin sutures and continuous conjunctival sutures are removed.

After a period of about 2 months the second stage of the operation is done. The bridge is reprepared by a knife incision separating the previously united conjunctiva and skin. The bridge is retracted downward with a muscle hook and the new upper eyelid margin is marked on the skin of the flap with methylene blue or ink, curved downward slightly from a line joining the inner and outer canthi.

The flap is divided through its thickness along the line. The conjunctival and skin edges are joined with interrupted sutures along the new upper eyelid margin. The remainder of the flap retracts and is easily sutured to the lower border of the previously prepared bridge in two layers, the conjunctiva being closed with a continuous silk suture and the skin with interrupted silk sutures. All sutures can be removed in from 5 to 7 days.

One of the chief advantages of this procedure is that the use of cartilage or of a tarsal graft is not necessary.

—*Joshua Zuckerman, M.D.*

Neurofibromatosis and Congenital Unilateral Pulsating and Nonpulsating Exophthalmos. ANDRÉ J. BRUWER and ROBERT R. KIERLAND. *Arch. Ophth.*, Chic., 1955, 53: 2.

THE AUTHORS present 6 cases of congenital unilateral exophthalmos. In 5 of the cases there was dermatologic evidence of neurofibromatosis. In 3 of the 6 cases the exophthalmos was pulsating. The roentgenologic appearance of the head is typical in these cases. It is interesting that the proptosis may or may not be accompanied by the presence of a retro-orbital neurofibroma. The mechanism of the pulsation is discussed.

The condition appears to be so characteristic that a mistaken diagnosis is unlikely once the clinical and roentgenologic pictures are known.

Ocular Changes in Acute Systemic Lupus Erythematosis. F. CLIFTON and C. H. GREER. *Brit. J. Ophth.*, 1955, 39: 1.

THE CLINICAL, ophthalmoscopic and pathologic findings, including a complete autopsy examination in 2 cases of acute systemic lupus erythematosus, are reported. The ocular lesions consisted of a slight congestion of the retinal veins, circumpapillary edema, cotton-wool patches, and superficial retinal hemorrhages. In 1 patient, there was a subconjunctival hemorrhage early in the course of the disease. The retinal arterioles were normal. ACTH caused a regression of the venous congestion and a reduction in the size of the larger cotton-wool patches.

Histologic examination of the eyes revealed that some of the cotton-wool patches were cytoid bodies. The presence of chronic inflammatory cells in the uveal tract was noted. Cytoid bodies are found in many other diseases. —*J. Jack Stokes, M.D.*

Corneal Transplantation; a Review of 365 Operations. R. Townley Paton. *Arch. Ophth.*, Chic., 1954, 52: 871.

Three hundred and sixty-five corneal transplantations, all but 18 of which were performed by the author, were analyzed. After reviewing various other surgeons' results and opinions, he found that his results were in accord with their statements that there is an inverse relationship between the size of the opacity and the extent of the corneal vascularization on the one hand and the resulting clarity of the graft on the other.

Twenty-five patients necessitated a second graft operation, and 5 had three operations. Thirteen patients having a clear cornea on leaving the hospital, had no follow-up; 18 were checked in less than 2 months, and of these 55.6 per cent had clear, and 44.4 per cent had clouded corneas. The remaining 299 patients were followed up for 2 months or more; of these, 64.5 per cent had clear, and 35.5 per cent had clouded corneas. Seventy-five of the 299 had had keratoconus, which is the most favorable indication.

Excellent and complete tables are given in the original article and should be read by those interested in keratoplasty.

Keratoconus is generally considered the most favorable indication, and the author found 89.3 per cent of his patients (75) to have clear corneas, 1 requiring enucleation because of glaucoma.

Groenouw's dystrophy resulted in 85.7 per cent of the clear grafts (24 of 28 cases). This condition is second in the prognosis list in the author's series, although other surgeons rate it less favorably.

Next successful in the series was nonspecific scarring resulting in 68.8 per cent of the clear corneas (11 of 16 cases).

Twelve of 18 grafts with postulcer scarring remained clear (67.7%). Interstitial keratitis (45 cases) showed clear corneas in 62.2 per cent. Leucoma (9 cases) resulted in 5 clear corneas. Active ulcer, (6 cases, of which 4 were lamellar and 2 penetrating), resulted in 3 clear corneas and all of the patients were relieved of discomfort. In 11 cases with scarring of the trachoma, 5 of the corneas remained clear.

Chemical burns, traumatic wounds, and explosion injuries generally produced poor risks. Nine patients showed no clear grafts after chemical burns. In 2 cases of traumatic scarring the corneas remained clear, while in 7 of 10 explosion scars the corneas were clear. These results agreed generally with other surgeons' reports. Adherent leucoma (17 cases) resulted in clear corneas in 6 cases (35.5%). Fuch's dystrophy, previously considered a contraindication to transplantation, resulted in clear grafts in 4 of 13 cases (30.8%). The author believes that a graft should be done in these cases before it progresses beyond 20/200 vision.

Various other types of patients were operated upon, including those with sclerosing keratitis, band dystrophy, and bullous keratitis, with some success, but the cases were too few to tabulate.

The outcome regarding vision revealed that of 222 cases, 160, or 72.1 per cent, showed some improvement. Fifty-seven (25.7%) of the patients saw 20/30 or better, 46 (20.7%) saw no better, while 13 (5.9%) had poorer vision. Three patients had panophthalmitis requiring enucleation.

In cases re-operated upon, 3 of 5 corneas remained clear, but only 2 patients had visual improvement.

Of 54 lamellar grafts, 12 were done therapeutically, 15 remained clear, and 19 clouded. Four of these were preparatory to a penetrating graft, but 3 of the 4 clouded.

This very extensive report is of great value to all ophthalmologists and should be read in full. The author, known for his ability and experience in this field, has contributed much toward elucidating many important factors in this relatively new branch of specialized surgery. —*Albert C. Frell, M.D.*

Late Results of Penetrating Keratoplasty. Max Fine. *Arch. Ophth.*, Chic., 1955, 53: 13.

Noting the lack of statistical data on the late results in penetrating keratoplasty, the author conceded that few surgeons do a large number of such operations. The selection of cases varies greatly and pooled results are inaccurate.

Previous to 1935, the number of patients showing visual improvement varied from 12.5 per cent to 46.7 per cent. In 1947, a symposium on 381 cases observed for 4 months or longer, indicated that 63.5 per cent of the grafts were clear and 36.5 per cent were cloudy. In 253 cases only corneal pathology was present, the remainder being excluded from further analysis. Seventy-nine of the 253 cases were diagnosed as most favorable cases for surgery, but only 6 patients regained 20/30 or better vision. Thirty-two had 20/100 or better, and thirteen had less than 20/200 vision. Seventy-four patients of the original 253 were moderately favorable and had 20/200 or less vision preoperatively, and 52.7 per cent obtained 20/100 or better vision. Least favorable cases, numbering 64, were 10.9 per cent improved to 20/100 or better.

Summarizing the 253 cases, 229 patients had 20/200 or less and 36.2 per cent had 20/100 or better vision. Twenty-four patients had 20/100 or better vision and 13 were made worse by surgery, resulting in 20/200 vision or less.

Another analyzed group of 165 operations showed that 13 per cent of the patients improved to 20/200 or better; 52 per cent showed no improvement, and loss of vision occurred in 35 per cent. Keratoconus improved in 10 out of 35 patients.

In April 1949, R. T. Paton reported 100 cases, 55 per cent resulting in clear grafts, 45 per cent in cloudy grafts. Visual results were omitted.

In 1948, several French authors reported 172 cases, "measurable vision" being obtained in 53 per cent of all types of cases.

Francheschetti obtained functional improvement in 41 per cent of 114 cases, grouping his cases on the basis of prognosis and type. He noted that in keratoconus and hereditary degenerations, 100 per cent of the grafts were clear; in infectious opacities 50 per cent were clear; and all grafts failed in traumatic and aphakic cases.

In 1950 Lohlein, of Berlin, reported his results in 286 operations: 5.6 per cent were completely lost, 10.8 per cent were made considerably worse, and 30.3 per cent showed no change; 53 per cent had improved vision.

Penetrating grafts were performed by the author in 100 cases observed for periods of from 18 months to 15 years. Since edema of the graft can appear up to 18 months, that observation period was chosen as the minimum. The series included cases of cataract, amblyopia, glaucoma, and other diseases. Of the 100 patients, 5 had two operations on the same eye and 1 patient had three operations, all of which failed. Several patients received preparatory superficial keratectomy, some irradiation, others soft x-ray and beta radium. Such measures were found to be generally useless. The patients' ages varied from 14 to 66. In 76 cases, the square graft technique was used; in 24 cases, round grafts were used.

Complications were classed as immediate and late. Immediate complications were iris adhesions and secondary glaucoma. In 10 cases adhesions of the iris to the wound developed. Glaucoma developed, or had been present, in 10 cases. Cyclodialysis later controlled the disease in 6 of these; in 1 patient the glaucoma was controlled medically, in 2 patients it was uncontrolled, and one other had iridectomy, lens extraction, and cyclodiathermy which proved successful.

Late complications were clouding and ectasia. Twenty-four per cent suffered late clouding from 3 weeks to 18 months postoperatively. The sequence of clouding showed generalized edema and haziness, folds in Descemet's membrane, fine haziness of Bowman's membrane and in some cases which were vascularized preoperatively, vessels entered the graft. Some cloudy grafts never became vascularized. The only portion of the eye which showed reaction was the graft; no iritis, iridoplegia, or adjacent keratitis ensued.

The later the clouding appeared, the more prompt was the recovery. Cortone and hydrocortone appeared most effective. The author traced the reaction of clouding to an endothelial dystrophy due to an antigen-antibody reaction.

Ectasia occurred in 3 cases; this was repaired by reopening the wound over one-half to two-thirds of the circumference and suturing with direct sutures.

Results tabulated in a chart show that 74 cases were improved, 16 were not improved, and 10 were made worse.

An excellent summary in chart form includes the following data: per cent of improvement, vision and refraction, final state of the graft, complications, and comment on each. —*Albert C. Frell, M.D.*

Traumatic Implantation Cysts of the Iris; with Special Emphasis on Surgical Aspects. A. Benedict Rizzuti. *Am. J. Ophth.*, 1955, 39: 13.

The author discusses the management of traumatic implantation cysts of the iris.

Following perforating injury of the cornea or cataract extraction, epithelial elements from the cornea or conjunctiva may become imbedded in the iris where they may proliferate and develop into cysts. These cysts, which tend to enlarge, may cause secondary glaucoma and, in exceptional cases, sympathetic ophthalmitis with eventual loss of the eye.

Traumatic implantation cysts comprise pearl cysts, serous cysts, and epithelial-invasion cysts of the anterior chamber.

Pearl cysts, the most common, are opaque, round or oval, and present a shiny gray luster. They are imbedded within the body of the iris and are usually associated with a small foreign body, or eyelash, accidentally introduced into the anterior chamber and on which some epithelial structures had remained adherent.

Serous cysts of the iris which appear pale yellow and translucent develop in a similar manner. They are not usually associated with the presence of any foreign bodies.

Epithelialization of the anterior chamber may also result in cystlike formations of the iris but they are caused by an ingrowth of surface epithelium proliferating along the edges of a poorly healing corneal wound. This proliferation may extend to the posterior surface of the cornea or the anterior surface of the iris, and even the posterior surface of the iris or the anterior surface of the lens.

There are three clinical stages in the development of cysts: the quiescent stage, which is followed by the stage of iridocyclitis, and finally by glaucoma.

As the cyst grows, its innermost layers usually degenerate and produce a fluid which acts as a chemical irritant which in turn filters through the thin cyst wall, enters the anterior chamber, and produces an iridocyclitis. If the cyst encroaches on the filtration angle, glaucoma may result.

Differential diagnosis is important. A history of accident or of surgical trauma is of utmost importance in the diagnosis of implantation cysts. Moreover, they should be differentiated from malignant neoplasms of the iris which are darker and grow much more rapidly.

True implantation cysts should also be differentiated from cystlike formations resulting from epithelial invasions of the anterior chamber. The diagnosis of epithelial invasion cyst of the anterior chamber is based on the presence of a poorly healed corneal wound, a flat anterior chamber, and a gray, veil-like filamentary structure on the posterior surface of the cornea or on the anterior surface of the iris. If surgery is attempted, the condition may progress rapidly and lead to loss of the eye.

Iridectomy after aspiration of the cyst offers the best prospect of cure when instituted early, before the cyst has become adherent to the posterior surface of the cornea and before secondary glaucoma has set in. Aspiration prevents sudden rupture of the cyst wall, lessening the possibility of spilling the fluid contents into the anterior chamber with recurrence of the cyst.

Any caustic solution injected into an iris cyst may accidentally enter the anterior chamber, act as a corrosive, and produce disastrous results.

If secondary glaucoma is present and it fails to respond to the usual miotics, a filtering operation may be done at the same time.

Proper surgical technique consisting of preliminary aspiration of the cyst followed by iridectomy produced an apparent cure in one case, which is reported.

—*Joshua Zuckerman, M.D.*

Choroidal Metastasis of Bronchial Adenoma; Adenoid Cystic Carcinoma Type. MARION M. RICKETTS, THOMAS PRICE, and MAXWELL THOMAS. *Am. J. Ophth.*, 1955, 39: 33.

THE AUTHORS report what appears to be the first case of a choroidal metastasis of a bronchial adenoid cystic carcinoma type of adenoma in a 33 year old man. The primary bronchial tumor responded to x-ray irradiation.

Six months after the occurrence of the respiratory symptoms the patient complained of visual impairment of the right eye, and a tumor mass was found in the inferior portion of the fundus. The use of radioactive phosphorus and an aspiration biopsy did not aid in the diagnosis. Microscopic examination of the eyeball, enucleated because of the rapid growth of the neoplasm, demonstrated that this was a metastasis of the bronchial tumor.

It is pointed out that because of its slow growth and the difficulty of follow-up, the malignant properties of this tumor are not generally recognized.

—Ray Karchmer Daily, M.D.

EAR

Multiple Areas of Necrosis and Anaplerosis Throughout the Temporal Bone; Based on the Histologic Study of 2 Cases. GEORGE T. NAGER and MATHILDE NAGER. *Ann. Otol. Rhinol.*, 1954, 63: 923.

DURING A STUDY of 300 temporal bones at the Otologic Research Laboratory of Johns Hopkins Hospital, the authors discovered two bones with multiple obscure lesions in the otic capsule and ossicles. The lesions involved all three layers of the otic capsule. No evidence of generalized bone disease was apparent. The earliest manifestation was a necrosis of bone followed by localized perivascular accumulations of granulation tissue, progressing to bone absorption and sequestration. Large giant cells were a prominent feature.

The authors are of the opinion that this bone disease was characterized by exacerbations and remissions. The lesions apparently did not result in hearing loss or facial paralysis. Although some similarities to congenital luetic lesions were noted, a hitherto unrecognized bone disease affecting the ear region is postulated.

—John R. Lindsay, M.D.

NOSE AND SINUSES

Lymphomas of the Nasopharynx and Pharynx. STANTON A. FRIEDBERG and GEORGE M. HASS. *Arch. Otolar.*, Chic., 1954, 60: 677.

THIS is an instructive article on the problems concerned with lymphoma originating in the nasopharynx and pharynx. Ten cases are presented in detail. In the majority of the cases the disease was progressive and fatal. The material consisted of 1 patient with a giant follicular lymphoma, 2 patients with malignant lymphoma of the lymphoblastic type, 2 with malignant lymphoma of the lymphocytic type, 1 patient with malignant lymphoma of Hodgkin's type, and 4 patients with malignant lymphoma of the reticulum cell type.

Pathologic studies supported the concept that these types of tumors are related and may have a common origin. It was difficult to predict the subsequent course of the disease by the histologic appearance. Some cases appeared to have a unicentric origin while others had a multicentric origin.

Treatment in some cases controlled the generalized disease but resulted in tissue alterations which resulted in the patient's death.

There was no clinical method of differentiating the various types of lymphoma.

—John R. Lindsay, M.D.

MOUTH

The Axhausen Operation for Cleft Lip Repair Modified After the Hagedorn Le Mesurier Principle. HANS MAY. *Plastic & Reconstr. Surg.*, 1955, 15: 15.

MAY recommends the quadrangular flap method for providing the normal fullness of the lower lip in the repair of a cleft lip. He has incorporated this flap into the Axhausen technique with consistently good results. For details of the procedure, the original article should be consulted. The various steps are well illustrated.

—John R. Lindsay, M.D.

SURGERY OF THE NERVOUS SYSTEM

SPINAL CORD AND ITS COVERINGS

Clinical Symptoms and Operative Treatment of Acute Purulent Infections of the Intervertebral Disc (Klinisches Bild und operative Behandlung des akuten eitrigen Wirbelbandscheibeninfekts). W. WEBER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 585.

THE AUTHOR PRESENTS 15 cases of intervertebral disc infections seen between 1948 and 1954 in the surgical clinic of the Municipal Hospital of Essen, Germany. In 6 cases the infection was considered to have been of hematogenous origin; in the other 9 cases the infection resulted from therapeutic or diagnostic procedures such as therapeutic paravertebral injection (3), lumbar punctures (2), and operation for prolapsed intervertebral discs (4).

The onset of symptoms is usually acute and is characterized by severe back pain which is aggravated by the slightest motion. Oftentimes it is impossible for the patient to sit or stand for several months. There are marked spasms of the paravertebral muscles and the patient holds his back stiffly and avoids any type of motion. The blood sedimentation rate is greatly increased while usually there is no leukocytosis. The temperature usually remains normal. Nerve root symptoms are rare. Early in the course of the disease there are usually no radiologic changes of the vertebral bodies; these occur only after destruction of the cartilaginous plates with gradual involvement of the subchondral bone layer and the appearance of marginal ostitis. Usually infectious osteolysis of the two bony plates surrounding the intervertebral space becomes visible in roentgenograms 9 weeks after the beginning of the infection. In the present series, on spinal puncture the spinal fluid showed an increased number of cells, and the diagnosis of sterile lymphocytic meningitis could be made.

The author describes the history of 5 typical cases, with laboratory findings. He strongly recommends operative treatment, as it shortens the period of morbidity and hospitalization, and he favors unilateral hemilaminectomy at one or several levels until the pathology is found. At the site of the intervertebral disc infection, the posterior spinal ligament usually bulges into the vertebral canal. The author makes an opening into it and removes radically all the granulation tissue, necrotic tissue, and often bone sequestra from the intervertebral space. Through a separate incision, approximately 5 cm. lateral to the midline, he introduces a drain into the intervertebral space, and injects 20,000 units of penicillin daily through the drain for a period of 10 days. The wound is otherwise closed tightly. He also gives the patient 400,000 units of penicillin or other antibiotics systemically for a period of 7 days. The drain is removed on the tenth day and the patient is usually able to get out of bed on the thirteenth postoperative day.

Convalescence is fairly rapid and most patients can be discharged from the hospital 3 weeks after operation. Depending on the occupation and personality of the patient, he is able to return to work in from 6 weeks to 6 months after his discharge from the hospital. Patients who are treated conservatively usually remain in the hospital in a cast, for periods of from 5 to 6 months, and suffer a great deal of pain during the entire period. A fibrous or bony union occurs between the two vertebral bodies adjacent to the débrided intervertebral space. —*George Perret, M.D.*

SYMPATHETIC NERVES

Definitive Sympathectomy (Gezielte Grenzstrangresektionen). ELMAR BUES. *Chirurg*, 1954, 25: 443.

STUDIES were made to determine the optimal levels for sympathetic chain resection in order to effect adequate sympathetic denervation of the extremities. Sweating function as observed by means of the iodine-starch test was used to measure the peripheral effect while roentgenograms were made to visualize the level of resection, identifiable by metal clips left in situ. Successful sweating tests were carried out in 55 patients a total of 83 times.

For the upper extremities, the results confirmed the findings of others—that bilateral section of the chain between Th 2 and Th 3 is sufficient. The stellate ganglion may be spared and it is not necessary to resect lower than Th 3. Deficiency of sweating was observed over the head, neck, and arms with a sharp lower borderline in the region of the dermatome, Th 2 to 3. This deficiency was found to persist for years.

In contrast to the relative anatomic constancy for the thoracic sympathetic chain, there is marked variability for the lumbar sympathetic chain. Nevertheless the author found that at the middle level of the lumbar vertebral bodies there appeared to be a transition zone related to the upper level of sweating deficiency after section. The upper level of sweating deficiency changes with section above or below the middle of the vertebral bodies. For example, the result of the sweating test was the same whether section was done at the superior border of L 2 or at the inferior border of L 1. He found further that the level of sweating deficiency remained the same if the chain was resected downward, the length of two vertebrae.

Some of his conclusions are: (1) sympathetic section at a given level produces a given sweating deficiency with a definite upper border; (2) the inferior resection level of the lumbar sympathetic chain is without particular significance with respect to effects on the leg (the upper resection level is of much more significance); (3) for sympathetic denervation of the lower leg and foot, resection in the region of the third lumbar vertebra is adequate and the chain at the level of L 2 may be spared; (4) for a higher level of denervation of the leg, resection must be done at a higher level but should not be done unnecessarily high. For denervation of the lower half of the thigh, resection is done at the level of the upper edge of L 2; (5) because of a certain incidence of disturbances of sexual func-

tion following resection of L 1, high resection is not done unless indicated; and (6) evidence is presented which indicates that one can achieve a given aim by carrying out sympathectomy at the proper anatomical level. —*John L. Lindquist, M.D.*

MISCELLANEOUS

Raynaud's Disease and Its Management (Die Raynaudsche Erkrankung und ihre Behandlung). P. Sunder-Plassmann, H. J. Hillenbrand, and A. Schürholz. *Deut. med. Wschr.*, 1954, 79: 1509.

Since 1938 the author has contended that Raynaud's disease results from localized toxic injury to the central, as well as the peripheral, sympathetic nervous system. If there is a central as well as peripheral abnormality underlying the disease, one would expect to observe (in addition to the peripheral disturbances) manifestations of the disease in other parts of the body. A thorough study from this point of view was carried out in 25 unselected patients.

These studies confirm the observation that Raynaud's disease appears almost exclusively in females. The age of these patients was between 19 and 67 years. There was a history of infectious disease preceding the onset of Raynaud's disease in some cases and a relationship was noted between menstruation and the occurrence of Raynaud's phenomena. Significant endocrine disturbances were frequently found. Functional as well as organic gastrointestinal complaints were common and in a number of patients severe perioral and paradental disturbances were present. In 40 per cent of the patients evidence of significant renal disease was found. These findings suggest vasomotor disturbances arising centrally and affecting various parts of the body other than the extremities.

With respect to therapy, it is important to make an early, correct diagnosis. Among conditions which may simulate Raynaud's disease are cervical rib, scalenus syndrome, nerve injuries, syringomyelia, lead poisoning and chronic hemolytic anemia. When these are ruled out and a diagnosis of Raynaud's disease is established, early therapy should be primarily conservative. In early cases favorable results are obtained following stellate infiltration with novocain. Occasionally vasodilating drugs and therapeutic measures to increase blood flow are indicated. Gynecological treatment may be necessary because of menstrual disturbances. Thyrotropic hormone may be of benefit in some cases, especially in those recurring following sympathectomy. Hormone therapy may be alternated with the administration of vitamin B_1 but both should not be given simultaneously. Surgical treatment is undertaken only in cases of frankly progressive Raynaud's disease.

Because the cases in this series were of long standing, surgery was necessarily the principal form of treatment. Formerly stellectomy was the operation used, but more recently thoracic preganglionic sympathectomy has been the procedure of choice. In 5 cases improvement was obtained on both sides of the body following a unilateral operation.

Unfortunately, there is a 50 per cent recurrence rate after surgery for Raynaud's disease of the upper extremity, but the attacks are not so severe or frequent and they respond more readily to conservative measures. Better results are obtained following sympathetic surgery for involvement of the lower extremities. Hormone therapy alone without sympathectomy is of little value in severe Raynaud's disease.

Determinations of cold agglutinin titers in patients with either Raynaud's disease or endangiitis obliterans were found to be within the limits of normal. There was no evidence that cold agglutinins play a role in the disease. Raynaud's disease is a disease of the vascular nervous system, and this system does not appear to exert a primary role in cold agglutination.

—*John L. Lindquist, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Early Roentgenologic Diagnosis and Preoperative Irradiation of Mammary Carcinoma (Zur radiologischen Fruehdiagnose und Fruehtherapie des Mammakarzinoms). E. MUNTEAN. *Fortsch. Roentgenstrahl.*, 1954, 81: 719.

THE AUTHOR, a roentgenologist, has been collaborating with Kratochvil, a surgeon at Graz, Austria, in the study of methods for improving the results in the treatment of cancer of the female breast.

From the author's statistical studies, he concludes that the combined surgical and roentgenologic treatment of this condition affords ultimate results which are superior to those of either surgical therapy or irradiation therapy alone. Further improvement lies in the earliest possible instigation of therapy.

A study of the literature indicates that biopsy is not devoid of danger. Kohler now uses biopsy only in rare instances and cites the statistics of Adair who claims by the avoidance of biopsy immediately before the operation in 283 patients to have reduced the percentage of 5 year nonsurvivals from 50 per cent to 20 per cent; and of Harrington who observed an increase in the axillary metastases in malignant tumors of the breast from 63 per cent in those without biopsy to 74 per cent in those with biopsy. The experiments of Mandl are cited, in which an India ink preparation was injected into the breast a half-hour before its removal. Following the operation the ink could be demonstrated in the axillary lymph glands.

The author, together with Kratochvil, has been studying the roentgenologic possibilities in the diagnosis of mammary cancer, and has attempted to determine how far this method can be utilized in limiting the need for biopsy.

In his studies the author has been using a slight modification of the method of roentgenologic diagnosis of cancer of the breast described by J. Gershon-Cohen and Helen Ingelby (*Am. J. Roentg.*, 1952, 68: 1; *Internat. Abst. Surg.*, 1953, 96: 98).

A series of 11 roentgenographic reproductions in the original article show what can be expected in the examination of the normal breast and in the differentiation between malignant processes and the various mastopathies.

On the whole, the author finds that with the roentgenologic diagnostic method described, biopsy examinations can be definitely limited. The author now advises biopsy only when the roentgen findings are not conclusive. —*John W. Brennan, M.D.*

Early Surgical Diagnosis and Therapy of Mammary Carcinoma with Particular Reference to Preoperative Radiation (Zur chirurgischen Fruehdiagnose und Therapie des Mamma-Karzinoms unter Beruecksichtigung der praeoperativen Bestrahlung). K. KRATOCHVIL. *Fortsch. Roentgenstrahl.*, 1954, 81: 727.

THE AUTHOR cites the reported instances in which recurrence of mammary cancer has developed as late as 22 years after operation and emphasizes his belief that almost every woman with mammary carcinoma dies of metastases, if only she lives long enough. He concludes that any extension of the usual methods of treating this condition (irradiation, surgery, even the ultraradical procedures of Prudente and Wangensteen) will do no more than lengthen the period of survival.

Although improvement in results may perhaps be expected from improved roentgenologic technique rather than from more radical surgery, the author believes that the utmost effort should be directed to the earlier detection and earlier recognition of the malignant transformation or development. The importance of recognition is stressed; in fact, the author believes that all pathologic breast conditions other than cancer should be regarded as precancerous. He presents a number of histologic slides which clearly depict the transformation of a benign breast condition into a malignant one. Nevertheless, the uncritical preoperative irradiation of the suspected isolated nodule is deprecated. If biopsy should prove necessary to establish the diagnosis it is better to avoid producing the frequently marked changes in the cancer cell, especially in the type which is sensitive to the X-ray, which results from preoperative irradiation.

The diagnosis, once established with reasonable certainty, is an indication for preoperative irradiation, surgery, and postoperative irradiation. The operation should be done within 2 to 3 weeks after conclusion of the initial irradiation. An important reason for not putting off the surgical phase too long after the preliminary irradiation is that the patient, when she sees the diminution in size of the tumor mass under the effects of the ray, may refuse, until too late, surgical treatment. The author, as have others, has always found in the histologic study of the removed breast following preoperative therapy, residual tumor cells which, at least from their histologic appearance, seemed capable of further development. For this reason he does not like to put off the surgical phase too long as metastasis may occur between the time of the preoperative irradiation and the removal of the breast.

In the matter of early diagnosis, the author has been collaborating with E. Muntean in a study of the possibilities inherent in the Gershon-Cohen method of roentgenologic diagnosis of early cancer of the breast, and he finds it of significant help. This method of diagnosis may be helpful in several ways: there may be an unexpected decrease in size of an especially sensitive tumor nodule; the tumor nodule may be more surely and more easily detected in a huge adipose breast; the distinction between mastopathy and carcinoma may be made in those instances of retracted nipple which may be present in both benign mastopathy and cancer. By means of the roentgenologic method, finally, the localization of the lesion in the secreting breast may be determined much more safely than by the method of mammography, and the

correct excision, not only for biopsy diagnosis, but for complete removal of the focus of mastopathy will be indicated.

Just as in carcinoma of the portio uteri, the earliest possible diagnosis is necessary in mammary cancer.

—John W. Brennan, M.D.

Adrenalectomy for Breast Cancer. STANFORD CADE. *Brit. M. J.*, 1955, 1: 1.

THE RATIONALE of bilateral oöphorectomy and adrenalectomy is the elimination of all known sources of hormones which can influence the growth of mammary cancer and the creation of a physiological environment poor in steroids. Mammary cancer varies in its rate of growth and power of dissemination. The variation noted in different histological types, in different age groups, in different hormonal states (premenopausal and postmenopausal, and in pregnancy and lactation) indicates that the hormonal influence is variable and that some tumors are dependent to a greater degree than others on hormones and that some are independent of them. The early localized stage of the disease is controlled by surgery; extension may be alleviated by radiotherapy, and androgens and estrogens may arrest the spread of disease for variable periods. Bilateral adrenalectomy is indicated when the disease is disseminated and no longer amenable to treatment by these other means.

This report is based on the experience of 56 bilateral adrenalectomies in advanced and disseminated breast cancer. A study of these patients showed that about one-third of them were no larger under hormonal influence, and in these no benefit was obtained; in the remaining two-thirds there was a variable degree of improvement lasting up to 24 months. The selection of patients was limited only to those to whom nothing further could be offered. In every case, skeletal, visceral, or soft tissue metastases were widespread and the expectation of life was very limited. Among such cases, involvement of the lungs and heart to an extent which impaired vital function was regarded as the main contraindication for the operation.

Cortisone was used in the preoperative and postoperative management of these cases. Doses of 100 mgm. were given intramuscularly at 48 hrs., 24 hrs., and 1 hr., prior to the operation and 100 mgm. were given every 6 hrs. for the first day following surgery with gradual daily reduction until a 50 mgm. daily maintenance dose was reached. Noradrenaline was used in emergencies for a marked fall in the blood pressure. The practice was to carry out bilateral oöphorectomy and unilateral adrenalectomy in one stage and postpone the second stage for 7 days. The operation is technically simple, but the adrenal glands must be handled with care. In most patients the convalescence was smooth.

Eight of the 56 patients died: from pulmonary embolus following the operation, cardiac arrest during surgery, renal failure (2), cerebral metastases, and from pleural and pericardial involvement (3). Twelve patients derived no benefit at all. In 14 there was no alteration in the metastases, although some improvement in the general stage of health and relief of the symptoms was obtained. In 4 there was no relief of symptoms, although local improvement was noted.

In 13 patients the results were remarkable in the sense that bedridden patients with severe pain became ambulatory and no longer required pain-relieving remedies. The subjective improvement was accompanied by an increase of weight and a return to a nearly normal life. Objective improvement was assessed by the healing of pathologic fractures, alteration of osteolytic lesions to normal bone structure, shrinkage of visible external tumors, such as a primary tumor, skin nodules, enlarged lymph nodes, and disappearance of metastases in the omentum, peritoneum, lungs, liver, and in the choroid. Improvement can usually be noticed within a few days of the operation. If no improvement occurs within 1 week, the operation is likely to prove a failure.

At present there is no method by which to forecast whether adrenalectomy will be a success or a failure. Although there is no likelihood of any permanent effect, the results are encouraging and it seems justifiable to advise the operation at an earlier stage of the disease.

—David T. Petty, M.D.

TRACHEA, LUNGS, AND PLEURA

Arteriovenous Aneurysm of the Pulmonary Vessels. H. ERINGA, R. TER BRUGGE, N. G. M. ORIE, and L. D. EERLAND. *Arch. chir. Neerl.*, 1954, 6: 269.

ALTHOUGH the first description of arteriovenous aneurysm of the lung was noted by Wilker in 1917, it was not until 1942 that a right pneumonectomy was successfully accomplished because of lesions in the lower and middle lobe. All the typical shunt phenomena existing beforehand disappeared following the operation.

In about one-half of the reported instances a relationship with Rendu-Osler's disease has been demonstrated. The triad of this disease—telangiectases, hemorrhages, and hereditary trait—is readily recognized when fully developed. The symptomatology is based upon the amount of nonoxygenated blood leaving the lungs. The symptoms and signs of pulmonary arteriovenous aneurysms are cyanosis, hypoxia, polycythemia, increased blood volume, fatigue, and certain cerebral manifestations such as dizziness, disturbances of speech, vision, and hearing. There is usually no cardiac enlargement. There may be a localized murmur over the site of the abnormality. The x-ray examination of the thorax may show a moderately intent sharply demarcated shadow, often with lobulated edges which pulsate. The electrocardiographic signs are not specific. Tomography and angiography may aid in the diagnosis.

The chief dangers from the disease are progression of the size of the shunt, pulmonary hemorrhage, and infection with streptococcus viridans.

Many authors believe that once the diagnosis of arteriovenous aneurysms of the lung is made, surgical treatment is required. The present authors feel that if there are subjective or objective manifestations of the arteriovenous fistula, operation is indicated; that if the arteriovenous aneurysms are bilateral the problem must be individualized. The authors describe the case history of 7 patients, in 5 of whom cyanosis was absent and there was mild or no hypoxia.

—Jerry A. Stirman, M.D.

Resection Surgery in Tuberculosis; Complications and After-History. RICHMOND DOUGLASS, E. B. BOSWORTH, JAMES M. JUDD, and K. H. CHANG. *J. Thorac. Surg.*, 1955, 29: 136.

THIS is a thorough, detailed statistical analysis of the postoperative course and after-history in 507 consecutive patients who underwent pulmonary resection for tuberculosis. The authors realize that the 24 month follow-up is too brief. The patients were divided into two groups: (1) the "salvage group" including those with extensive and usually uncontrolled tuberculosis and those in whom thoracoplasty failed; and (2) the "elective group."

The early mortality rate in the salvage group was almost 15 per cent, and in the elective group 1 per cent. In the salvage group, about 20 per cent of the patients suffered postoperative complications, three-fifths of which were serious. In the elective group almost 20 per cent had postoperative complications, but only one-fifth of these were serious. Tuberculous complications accounted for 1 per cent of the complications in the elective group and 50 per cent of the complications in the salvage group.

A two-year follow-up study gave the following results:

1. In the salvage group of 110 patients, 70 per cent were well, 18 per cent were active, and 12 per cent died.

2. Of 256 patients in the elective group who were thought to have active tuberculosis left in situ at surgery, 95 per cent were well, 3 per cent had active tuberculosis, and 2 per cent died.

3. In the elective group of 141 patients with no recognized residual disease there were no deaths and no patient had active disease after two years.

—John C. Carlisle, M.D.

Meningoceles of Intrathoracic Origin (Les méningocéles a développement intrathoracique). CH. GERNEZ-RIEUX and G. LEPAUL. *J. fr. méd. chir. thorac.*, 1954, 8: 633.

THE CONGENITAL ANOMALY described by the authors, known in the English literature as intrathoracic meningocele, is named dorsolateral spinal meningocele of intrathoracic origin by the authors. A historical review showed that only 22 cases have been described in the world literature; brief abstracts of these cases are given. The authors add a case of their own.

A 59 year old male with tuberculosis of the right upper lobe was otherwise free from complaints except for mild pain of the intercostal neuralgic type at the middle of the base of the right hemithorax. Roentgenograms showed a well defined homogeneous mass 4 cm. in diameter, originating paravertebrally at the level of the eleventh and twelfth dorsal vertebrae. Transthoracic needle puncture into the mass yielded a clear fluid which, on chemical and cytologic examination, was compatible with cerebrospinal fluid; lipiodol injection and roentgenogram aided the diagnosis of right lateral intrathoracic meningocele. After observation for more than a year the size and dimensions of the meningocele showed no change from the time of the initial examination.

Most meningoceles arise in the lumbosacral region, the cervical spine being the next common site. Localization in the dorsal region is rare; when it occurs the meningocele is characteristically extrathoracic. Review of the 23 published cases, including the authors', further reveals that intrathoracic meningocele may occur in either sex; all but 2 cases occurred among Caucasians. The majority were diagnosed in individuals from 30 to 35 years old, with extremes of 7 months (1 case) and 63 years (1 case). The lesion is usually discovered in the course of meticulous physical examination, sometimes because of symptoms referable to it, or because of the coexistence of another disease, such as pulmonary tuberculosis; the history of trauma is rarely given. The lesion presents as a subpleural paravertebral mass which is connected with the spinal canal by a pedicle. The mass is usually round but occasionally it is multilobular, and its dimensions vary between 4 and 10 cm. in diameter. The location is most frequently apical (10 cases), but may be basal (6 cases), parahilar (3 cases), or left retrocardiac (2 cases); 1 bilateral meningocele has been reported.

Histologic examination shows the cyst to be dura. The fluid is cerebrospinal. The mass does not shift with respiratory movements or changes in position of the subject. Spina bifida is a frequent accompaniment; other vertebral anomalies may be coexistent. Thirteen of the 23 patients also had neurofibromatosis (Recklinghausen). The embryology of the lesion is described. There are no characteristic symptoms and the neurologic signs are inconstant. The diagnosis is usually made by means of roentgenograms which reveal a discrete, homogeneous opaque mass, located in the posterior mediastinum and which is paravertebral. Tomograms add further definition. Myelograms, transthoracic local injection of lipiodol, and examination of the fluid withdrawn confirm the diagnosis. The lesion shows little change with time; no instance of progressive enlargement with rupture, meningitis, or other complications have ever been reported.

Treatment is usually nonoperative. Surgical intervention is reserved for the lesion which is large, or enlarging, is symptomatic, or is not diagnosed until the time of exploratory thoracotomy.

A bibliography of the 22 cases in the literature is appended. *—Edwin J. Pulaski, M.D.*

HEART AND PERICARDIUM

Four Years' Clinical Experience with Internal Mammary Artery Implantation in the Treatment of Human Coronary Artery Insufficiency, Including Additional Experimental Studies. ARTHUR VINEBERG, D. D. MUNRO, HERMAN COHEN, and WILLIAM BULLER. *J. Thorac. Surg.*, 1955, 29: 1.

EVALUATION of surgical revascularization is dependent on the analysis of anatomical and functional criteria. Anastomotic channels between the extracardiac source of blood and the coronary arteries should be adequate in number and of such size as to provide the myocardium with a sufficient supply of blood. These new blood vessels must persist and function for periods greater than 6 months. In experiments on animals, after the revascularization procedure the animal should survive ligation of the anterior descending branch of the left coronary artery. The latter, followed

by interruption of the extracardiac blood supply, should cause the death of the animal. Proof must be produced of an increased blood flow of arterial blood utilizable by the heart muscle. A return to normal exercise tolerance must be shown in animals receiving an extracoronary blood supply.

The blood supply of the myocardium has a definite anatomic pattern which is characterized by a sponge work of blood vessels within the musculature, namely, arteriosinusoidal vessels and myocardial sinusoids. The terminal branches of the coronary artery traverse the surface of the heart and then pierce the myocardium at right angles to it. In the endocardium they resume their horizontal course and also form an arteriolar bed which is rich in arborizations and communications with the arterial sinusoids and the myocardial sinusoids. Arteriosclerotic changes in the coronary arteries most usually involve the epicardial segment of the vessel while the intramural portion is relatively free of disease. In the normal human heart intercoronary anastomoses are infrequent, but in the pathologic heart anastomoses frequently develop distal to the point of occlusion.

Implantation of the internal mammary artery may be of two types: one in which the artery is buried with its end opened into the myocardium, the other in which the end of the internal mammary artery is closed but with the open sixth intercostal artery implanted into the myocardium. With the latter technique, the artery will be found to branch and communicate with the myocardial sinusoids within 12 days. After 3 or 4 weeks, there is a development of rich arteriolar anastomoses between the coronary artery and the mammary artery within the left myocardium. In 50 per cent to 75 per cent of the experimental operations in animals the implantation of the internal mammary artery resulted in a "take." With the perfusion pressure equal to the carotid pressure, the flow rate of blood through the implant varied from 3 c.c. to 21 c.c. Five months after implantation, oxygen saturation dropped from 98 per cent to 40 per cent as the blood traversed the mammary coronary anastomoses and reached the coronary sinus.

Patients with coronary insufficiency were divided into 4 groups: (1) patients with mild or intermittent angina, (2) patients with progressive coronary insufficiency without disability, (3) patients partially or totally disabled but without angina at rest, and (4) patients with status anginosus at rest. Patients in groups 1, 2, and 3 may be subjected to surgery but patients in group 4 must be considered inoperable because of the lack of sufficient cardiac muscle for revascularization. Further contraindications include such factors as the presence of left ventricular failure, hypertrophy of the left ventricle, advanced hypertension, and recent myocardial infarction.

A total of 29 patients have undergone implantation of the internal mammary artery. Of this group, 10 patients have been followed up to 4 years and 5 of them have returned to full work. In the second newer group of 19 patients followed now for 11 months postoperatively, 67 per cent have been relieved of pain and show increased exercise tolerance. The mortality for the entire group was 14 per cent but only 4.3 for those free of angina. —*B. G. P. Shafiroff, M.D.*

Arterialization of the Coronary Sinus in Occlusive Coronary Artery Disease; Coronary Flow in Dogs with Aorticocoronary Sinus Anastomosis of 6 Months Duration. ALVIN A. BAKST, ALBERTO ADAM, HARRY GOLDBERG, and CHARLES P. BAILEY. *J. Thorac. Surg.*, 1955, 29: 188.

THE AUTHORS report the results of their studies on a group of dogs in which the coronary sinus had been arterialized for a period of 6 months. They have previously reported similar experiments in dogs, with the findings 4 to 8 weeks following placement of the vein graft between the aorta and the coronary sinus. These two groups of animals are compared.

The most significant finding was that the apparent effectiveness of the shunt, well demonstrated in the dogs after 2 months, could no longer be proved in the group studied after a period of 6 months. Ligation of the circumflex branch of the left coronary artery resulted in a mortality rate of 20 per cent in the animals in which the coronary sinus had been arterialized for 4 to 8 weeks, and a mortality of 66 per cent in the 6 month group.

The authors also were completely unable to demonstrate retroperfusion of the myocardial capillary bed in the 6 month group of animals. This occurrence had readily been proved in the 2 month group. One of the few pertinent persistent findings in the 6 month group was a significant increase in the retrograde blood flow through the canalized circumflex artery. The authors believe this is due to the interarterial coronary collateral circulation. One last sign pointing toward the dispensability of the graft, however, was the fact that occluding the patent graft did not affect the retrograde flow. —*John C. Carlisle, M.D.*

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A SERIES of 21 aortic resections with homograft replacements was performed for 12 aneurysms and 9 constrictive lesions of the aorta. The operative mortality was 14.3 per cent. The majority of the grafts were lyophilized or freeze-dried. Sacciform lesions of the aorta may be removed by tangential excision and lateral aortorrhaphy. Fusiform aneurysms usually involve the entire circumference of the blood vessel and therefore require aneurysmectomy with graft replacement. Occlusion of the ascending aorta or transverse aorta even for brief periods tends to cause a fatality and thus preclude operation at this level. Occlusion of the thoracic aorta distal to the left carotid artery or the left subclavian artery may be tolerated if provision is made for the protection of the sensitive tissues of the spinal cord. The incidence of paraplegia seems to be increased with double cross clamping of the thoracic aorta and with the number of intercostal vessels ligated. In the present series of cases general hypothermia was used four times and local spinal refrigeration was used once, with periods of aortic occlusion varying from 53 to 62 minutes without paresis. The longest homograft measured 30 cm. in length and replaced the entire descending aorta from the left subclavian artery to the aortic hiatus.

Constrictive lesions of the aorta may be either congenital or acquired. Congenital coarctation is usually located in the isthmic region and comprises only a small section of aorta just distal to the left subclavian artery. In the infantile type the coarctation is proximal to the left subclavian artery with a long segment of constricted aorta. Aneurysmal dilatation may occur in the region of coarctation and involve bronchial and intercostal arteries. Acquired constrictive lesions are associated with local aortitis and segmental atherosclerosis involving the middle or terminal third of the descending thoracic aorta. Treatment consists of operative resection and replacement by aortic homograft. Well developed collateral vessels protect the body tissues distal to the point of cross clamping. Shunts and/or hypothermia are not necessary for the latter cases. All major vascular channels, especially the left subclavian artery, should be included in the restorative procedure. In one case, two skip areas of arteriosclerotic obliteration necessitated two separate grafting procedures for constrictions which involved the lower thoracic aorta and the upper abdominal aorta. At the second operation, the first homograft was examined and found to be soft and elastic with a supple intimal surface. The additional homograft attached at one end to the first homograft healed with primary union. —*B. G. P. Shafiroff, M.D.*

Intrasaccular Wire Tamponade of Thoracic Aortic Aneurysms (Die intraaneurysmale Drahttamponade von Aneurysmen der Brustaorta). OSKAR STEINHARDT. *Thoraxchirurgie*, 1955, 2: 351.

The author reports 8 cases of thoracic aortic aneurysm treated by a method of intrasaccular wire packing or tamponade which he describes in detail. (This differs only slightly from the procedure described in the United States by Linton.) Materials include 30 meter spools of 0.25 mm. stainless chrome-nickel steel wire roughened with emery cloth prior to sterilization, a thin blunt 15 cm. trocar, a pointed stylet several mm. longer than the trocar, a blunt "wiring" needle 1 mm. shorter than the trocar, with a lumen which accommodates the wire smoothly and which fits snugly but freely into the trocar, and, finally, a blunt stylet for this wiring needle, several millimeters longer than the needle.

After surgical exposure of the most superficial part of the aneurysm, the trocar with stylet in place is inserted and the presence of its tip in the lumen is verified by the pulsating jet of blood on withdrawal of the stylet. The tip of the blunt trocar is advanced to the opposite wall of the aneurysm, stopping the jet. Wire is threaded into the wiring needle to protrude 1.5 cm., and this protruded portion is curved slightly. The wiring needle with wire in place is inserted through the trocar. This latter is withdrawn a short distance and then reinserted with mild pressure to fix the end of the wire against the aneurysmal wall. Then the wiring needle is withdrawn over the wire until only about 1 cm. of the needle tip remains in the trocar. The trocar is withdrawn slightly, and the wiring needle with wire clamped to its head with thumb and forefinger is reinserted, to deliver a 14 cm. loop of wire to the lumen of the aneurysm. The procedure is repeated until the aneurysm is entirely packed and is firm to palpation. The blunt stylet is used to insert the terminal portion of wire. Adequate wiring of most aneurysms requires that several entry sites be used. Digital pressure is sufficient to stop bleeding from the puncture site. From 80 to 120 meters of wire were introduced into each of the aneurysms reported. Stray loops of wire up or down the lumen seem to have no deleterious effect.

The 8 patients on whom surgery was performed in the period from February to December, 1953 ranged in age from 53 to 69 years. All had moderate to severe symptoms attributable to the aneurysms, of which 7 were luetic and 1 was probably arteriosclerotic. Erosion of the vertebrae and ribs was demonstrable in 6, and a pulsating thoracic wall was seen in 4. Reasons for surgery in these patients over and above the prevention of eventual rupture included unbearable pain (3), severe dyspnea (1), threatened asphyxia (1), rapid enlargement of the aneurysm (1), and impending cardiac failure (1).

Three of the patients have died since surgery. A 60 year old hypertensive male with frequent decompensation died on the second postoperative day of a toxic enteritis and cardiac failure. A 55 year old male with bilateral recurrent nerve paralysis and respiratory stridor died 2.5 months after operation of multiple pulmonary abscesses following pneumonia. A 69 year old male with a large rapidly expanding lesion including the innominate artery died of pneumonia on the eighth postoperative day, having suffered repeated small cerebral emboli. Only this last patient's death is considered directly attributable to the operative method. All 3 patients came to postmortem examination, at which irregular peripheral thrombosis was found in each aneurysmal sac, especially pronounced in the man who survived 2.5 months. In each the central lumen remained free of thrombus although it was criss-crossed by the numerous wire loops.

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lipiodol. Barium is not used because of the danger of fulminant pneumonia. There is an apparent association of this anomaly with hydramnios.

Vogt's classification of the variations of this anomaly is given, including a survey of the frequency of these variations and the anatomical findings, which are also illustrated.

The author delves into the possible causes of this congenital anomaly and gives a survey of the treatment, particularly the European efforts in this field.

Important features in the preparatory treatment include proper positioning to prevent entrance of saliva and mucus into the trachea, regular suction drainage of the pharynx, antibiotic therapy, and other supportive measures.

The surgical treatment of choice is direct anastomosis, as first successfully performed by Haight in 1941. Operation in several stages may be necessary and this includes marsupialization of the blind pouch in the cervical region, followed by gastrostomy and later anastomosis between the proximal esophagus and the stomach. Operative treatment is most likely to be successful immediately after birth.

The author finally presents his personal observations in 7 cases with 3 survivals after direct anastomosis, and concludes that the unsatisfactory results were not so much due to the anesthesia and the operative technique as to the late diagnosis, which constitutes the difficulty in the treatment.

—Edward F. Lewison, M.D.

Operative Treatment of Congenital Esophageal Atresia in Several Stages. I. BOEREMA. *Arch. chir. Neerl.*, 1954, 6: 245.

THE AUTHOR, discouraged by the high operative mortality rate following single stage operative treatment of congenital atresia of the esophagus, developed a method in several stages to carry a lower risk. The first stage was the formation of an external fistula of the blind upper pouch of esophagus, dissected through a right anterior cervical incision, and sutured to the skin edges. That maneuver lessened the risk of pneumonia caused by aspiration of the contents spilled out of the filled pouch. After a week, during which the patient was fed by parenteral infusions, a right thoracotomy was performed, the esophagotracheal fistula was interrupted, and the ends sutured. A tube gastrostomy was made immediately through a small laparotomy incision.

After one year, the third stage of the operation was performed. The stomach and the lower esophageal remnant were mobilized on a pyloric pedicle, sparing only the right gastric and right gastroepiploic arteries. In order to reduce the bulk and the distensibility of the stomach in the chest and to prevent embarrassment of pulmonary and cardiac functions, a wedge of stomach was removed along the lesser curvature. The stomach was closed with 2 lines of sutures to form a narrow tube as long as its greater curvature. The laparotomy incision was closed, and the thorax reopened. The long stomach tube was passed through a small opening in the diaphragm either in front of or behind the hilum of the lung up to the apex of the pleura. The cervical fistula was dissected in the neck, and the stomach tube passed out through the neck incision. There, a two-layer anastomosis of the esophageal ends was made.

Although it is clear that the author is intrigued by this method, he has given it up in favor of a single stage technique, except where a previous cervical esophagostomy has been made, or where a single stage operation is not feasible because the lower esophagus is atretic. He does not favor ante-thoracic tubes, or intrathoracic jejunal tubes. The explanation for the return to a single stage method was the mortality rate, i.e., 2 out of 4 patients treated as described above. The causes for the 2 deaths, after the third stage operations, were not clarified by autopsies. The 2 surviving children are well, although one required dilation of the esophageal anastomosis.

—Leonard D. Rosenman, M.D.

Intraesophageal Ligation of Bleeding Esophageal Varices (Die Intraoesophageale Umstechung blutender Oesophagusvaricen). F. LINDER. *Langenbecks Arch. u. Deut Zschr. Chir*, 1954, 280: 66.

AFTER A SURVEY of the pathology of the esophageal varices, the different methods of conservative and surgical treatment in cases of acute bleeding of esophageal varices are discussed.

The author emphasizes especially the intraesophageal ligation of bleeding varices, which was first done by Boerema and later by Crile (*Arch. Surg.*, 1950, 61: 654 and *Surg. Gyn. Obst.*, 1953, 96: 573), and by Linton (*Surgery*, 1953, 33: 243). This method plays a very important part in acute profuse bleeding. It is believed that even in very desperate cases the bleeding can be stopped by such an approach.

The author discusses his own 2 cases in which such an operation was done. In 1 patient he found a regression of the esophageal varices in the esophagrams after 1.5 years. The other patient died on the third postoperative day in hepatic coma. Necropsy showed marked cirrhosis of the liver but no postoperative bleeding from the ligated varices.

—Frank R. Lichtenheld, M.D.

Tumors and Pseudotumors of the Inferior Division of the Anterior Mediastinum (Tumeurs et pseudotumors du thorax antéro inférieur d'origine sus-diaphragmatique). G. ROCHE and PH. DAUMET. *J. fr. méd. chir. thorac.*, 1954, 8: 449, 490.

IN THE PRESENT STUDY, lesions that project an x-ray shadow at the cardiophrenic angle are approached in two ways: (1) their inherent characteristics are analyzed; (2) the problem of their diagnosis is reviewed. All of the conditions discussed are relatively rare. The supradiaphragmatic origin of these tumors has been established previously.

The lesions that produce a cardiophrenic shadow syndrome are grouped in six categories:

1. Pleuropericardial cysts.

2. Other mediastinal opacities such as (a) dermoid cysts and teratomas; (b) bronchogenic cysts, (c) lipomas; (d) fibromas; (e) lymphangiomas; and (f) thymomas.

3. Cardiovascular shadows: (a) pericardial diverticuli; (b) myocardial aneurysms; (c) aneurysms of the pericardial aorta; (d) tumors of the heart or pericardium.

4. Pulmonary shadows (mostly of the middle lobe): (a) hydatid and other cysts; (b) round tuberculous lesions; (c) carcinomas.

5. Pleural shadows: (a) cystic pleural effusions (mainly interlobar); (b) primary localized pleural tumors.

6. Parietal shadows: (a) chondromas and other osteocartilagenous tumors; (b) tuberculous abscesses of the thorax.

The term pleuropericardial cyst as used here implies a cardiophrenic angle location and a histologic resemblance to pleural and pericardial tissues. In another location they are referred to as celomic cysts. Pleuropericardial cysts are as infrequent as thymic tumors, ranking fourth place in a composite series of 520 benign mediastinal tumors. They are, however, the commonest tumors of the cardiophrenic angle. For the most part, they are rightsided, silent, well circumscribed lesions which are discovered on routine x-ray examinations. They occur three times more frequently in males than in females, usually between the ages of 35 and 50. They have not been described in children.

If a lateral film is taken, the tumors are observed at the sternodiaphragmatic angle, rarely displacing the mediastinum. They are characteristically extrapulmonary and contain fluid within a thin membrane. Changes in shape are demonstrable on the roentgen film by deep respiratory movements, on films in the Trendelenburg position, pneumothorax and pneumoperitoneum. When clear fluid is obtained on needle aspiration, cystic lymphangiomas and hydatid cysts should be considered. Protein determinations (Rivalta test), the clinical history, and the Casoni test should aid in the differential diagnosis.

After pleuropericardial cysts have reached average size, they rarely increase in volume. Complications are rare.

Dermoid cysts and teratomas, the commonest tumors of the anterior mediastinum, are only rarely located at the cardiophrenic angle. The authors report one case. Reference is made to 5 other cases in the literature.

Lipomas, the rarest of all thoracic tumors, are found most frequently in the anterior mediastinum when occurring in the chest, and reference is made to 11 such cases in the literature.

Cystic lymphangiomas have the same mesenchymal origin as pleuropericardial cysts and contain fluid within a thin wall but are of rare occurrence in this area.

Thymomas, with their important relation to leucemia and myasthenia gravis, do not present the diagnostic problem of malignancy since they usually occur at a higher level.

Pulmonary, cardiovascular, and pleural shadows, considered and analyzed by the authors, are not discussed here because of their rarity.

It is suggested that the efforts to make a differential diagnosis of cardiophrenic angle lesions be directed to four questions: (1) What is the exact location? (2) Is the lesion cystic of solid? (3) Is it benign or malignant? (4) What is the exact nature of the shadow?

Since in doubtful cases it is frequently impossible to determine the true nature of the lesions, it is recommended, after the previously described tests have been performed, that the patient be advised to undergo an exploratory thoracotomy. If operation is refused, it should be remembered that these lesions are very rarely malignant.

Tumors and pseudotumors of the inferior division of the anterior mediastinum belong to the group of infrequent intrathoracic tumors, but represent an interesting clinical and roentgenologic entity.

In the differential diagnosis of thoracic tumors an accurate topographic location is most important. Cardiophrenic angle tumors are usually silent and found only when a routine x-ray film of the chest is taken. They can be seen clearly in the posteroanterior and lateral views since the shadow they cast lies between the sternum and costal cartilages in front, and the diaphragm behind. They overlap with the cardiac shadow anteriorly, fusing with the diaphragmatic shadow behind.

Once the shadow has been discovered, further tests are indicated. With the use of pneumoperitoneum and x-ray pictures taken at different angles, it is possible to distinguish between two groups of shadows: (1) shadows above the diaphragm, usually cast by pleuropericardial cysts, and (2) shadows below the diaphragm, on the right side, cast by liver tumor masses or hernias through Larrey's foramen (parasternal).

Since the lesion in cases of cardiophrenic shadows is usually benign, it may be difficult to decide which patient should be advised to submit to a surgical exploration. Many types of tumors may occur in this location—lipomas, fibromas, angiomas, parasitic cysts, and bronchogenic cysts.

Pleuropericardial cysts usually occur at the cardiophrenic angle. In 3 of 4 cases they occur on the right side; they are rounded, about the size of an orange, are nonadherent and easily enucleated, weigh between 100 and 150 gm., and contain a clear watery fluid within a thin membrane. The wall of the cyst is lined by a single layer of flat or cuboid cells and is composed of loose connective tissue. The exact physical and chemical characteristics of the fluid are indicated.

The shadow-producing mediastinal tumors are covered by the mediastinal pleura. With the exception of the large lesions, the tumors are medially located. Depending on their shape when seen through the thorax, they appear more or less pedunculated, but the first step in their dissection is that of making an incision in the mediastinal pleura. An easy avascular plane of cleavage is developed below the inclosed pleura; this plane is absent at the pericardial site.

The shadows produced by pseudotumors are produced by the liver and the great omentum, e.g.: (1) tumors of the liver, mainly hydatid cysts; (2) congenital and traumatic liver hernias; (3) congenital deformities of the hepatic dome; and (4) parasternal hernias of Larrey's foramen. The hernias occur between the sternal and costal insertions of the diaphragm, always contain a sac of parietal pleura and peritoneum, and, in 78 per cent of the cases, colon and great omentum.

The indications for intervention, and the surgical approach are difficult to establish and depend on the exact diagnosis which frequently is difficult to make.

In general there are two pitfalls which should be avoided: an unnecessary operation and an inadequate surgical approach. The surgical management will depend on the nature of the lesion—tumor, diaphragmatic hernia, or hepatic lesion.

When dealing with tumors, teratomas should be removed since they grow and may become malignant. Pleuropericardial cysts, however, do not become malignant, grow, or develop complications; therefore the only indication for surgery should be the uncertainty of diagnosis. In patients with nonoperative lesions careful roentgenologic follow-up examinations are indicated.

When there is no doubt that the tumor is mediastinal, some authors advocate a midline sternotomy; however, the transpleural anterolateral approach is more generally favored.

In operating on mediastinal tumors, two complications should be kept in mind. In one reported case, curare intoxication developed following a small dose of d-tubocurarine in a patient with a tumor in the cardiophrenic angle. Big doses of prostigmin resulted in rapid recovery of the muscular tone. On microscopic examination the cystic tumor contained thymic tissue. In another case reported by the authors, a 5-year-old child died of cardiac arrest while a huge dermoid cyst that involved most of the thorax was being removed.

In considering the operative treatment of diaphragmatic hernias, it is well to ascertain if they contain colon, are poorly tolerated, and if they are producing digestive and respiratory symptoms. Strangulation is rare; it occurred in only 3 instances in a series of 71 cases. If the sac contains great omentum, it is well tolerated but tends to increase in size due to abdominal pressure and possibly trauma. The best approach for a parasternal hernia is through the abdomen, particularly in the presence of large hernias, without adhesions. Resection of the sac is difficult or impossible, but this is a minor complication. The authors have operated through the thorax without any difficulty, but they mention a case of Santy's in which repair was not possible and an abdominal incision also was necessary.

With regard to the surgical lesions of the liver (particularly hydatid cyst), thoracotomy is the procedure of choice as it permits all the maneuvers required to handle this condition.

Exploratory thoracotomy is indicated in the doubtful cases in which diagnostic tests do not rule out the possibility of a malignant lesion.

—*Néstor S. Martínez, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Subcostosternal Hernia (Hernia Through the Foramen of Morgagni); Report of a Case. RAYMOND HELSBY and CHARLES WELLS. *Brit. J. Surg.*, 1954, 42: 274.

THE AUTHOR reports on a case of subcostosternal hernia. The patient, a widow aged 66 years, complained of regurgitation of acid fluid into her mouth for 18 months prior to admission whenever she lay down. By sleeping propped up on pillows, this symptom subsided. Three months later the patient experienced some fullness and discomfort in the epigastrium half an hour after taking food, particularly fried food, vegetables, and fruit. Vomiting, which became more and more frequent relieved these symptoms. The vomitus consisted of undigested food mixed with acid and sometimes bile. The patient had lost 28 lb. in weight.

On examination of the abdomen a succussion splash was elicited in the left upper quadrant and some tenderness in the right subcostal region. A fractional test meal showed an acid curve within normal limits, the aspirate containing neither blood nor bile. Radiography of the chest and a barium meal suggested an eventration of the right leaf of the diaphragm with interposition of the stomach and colon between the diaphragm and liver.

The abdomen was explored through an upper right paramedian incision. Immediately behind the lower end of the sternum there was a defect in the diaphragm, about 2 in. in diameter. Through this defect a large peritoneal sac extended into the chest. The sac contained the greater part of the stomach, transverse colon, and great omentum. These contents were easily reduced into the abdomen and the sac was then excised and closed at its neck. The defect was repaired by approximating its posterior margin to the posterior rectus sheath with interrupted thread sutures. The gallbladder was found to contain stones, and cholecystectomy was performed. It was also noted that the esophageal hiatus was patulous, easily admitting the tips of two fingers. Postoperative progress was uneventful.

In 1945, Harrington reported 404 cases of diaphragmatic hernia in which operation was performed. Among these, there were only 8 cases of hernia through the foramen of Morgagni. Two of Harrington's cases presented pulmonary symptoms only and were diagnosed clinically and roentgenologically as primary intrathoracic lesions. At operation the hernial sacs contained omentum. In the others, hollow viscera were involved and the patients had symptoms referable to the gastrointestinal tract.

Of 44 cases collected by Saltzstein, Linkner, and Scheinberg (1951) and 1 additional case of their own, only 21 patients were subjected to operation. In 33 of the 45 cases the colon, with or without other viscera, was involved in the hernia. In 7 patients, all aged 55 or over, the hernial sac contained the stomach and colon. Only 3 of these patients were subjected to operation.

Diveley (1950) reported on a 39 year old male with symptoms of pyloric obstruction in whom at operation the colon and omentum were found to be in the hernial sac. DeNicola and Vracin (1950) reported the case of a child aged 2 years who suffered from repeated abdominal cramps accompanied by coughing attacks with severe cyanosis. At operation the sac contained part of the liver, but no gut.

The author, in conclusion, finds it interesting to note the coincidental finding of a lax esophageal hiatus which accounted for the initial symptom of acid regurgitation in recumbency.

—Alan L. Dorian, M.D.

GASTROINTESTINAL TRACT

The Physiology of the Gastric Antrum: Experimental Studies on Isolated Antrum Pouches in Dogs. EDWARD R. WOODWARD, EDWARD S. LYON, JOHN LANDOR, and LESTER R. DRAGSTEDT. *Gastroenterology*, 1954, 27: 766.

VARIOUS EXPERIMENTS were designed for the direct investigation of the inhibitory effect of acid in the antrum on the antral phase of gastric secretion.

A group of animals was prepared to test the effect of *p*H on the secretory response to the local application of food to the isolated antrum. It was found that when solutions of food substances were applied to the isolated gastric antrum, secretion of acid gastric juice occurred from isolated pouches of all or part of the body and fundus of the stomach. This response was inhibited when the food substances were distinctly acid in reaction.

The effect of acid solutions applied to the isolated antrum on gastric secretion of nonantral origin was investigated. Animals were prepared with a gastric fistula and an isolated antrum pouch with intact blood and nerve supply. Inhibition of spontaneous gastric secretion by the application of acid to the antrum mucosa appears to be a function of hydrogen ion concentration and is not specific for hydrochloric acid. Another animal was prepared to test gastric secretion from the intestinal phase. It was found that the presence of acid in the antrum did not inhibit the intestinal phase of gastric secretion. Gastric secretion from histamine stimulation was not prevented or altered by the presence of acid in the antrum. Gastric secretion from vagus stimulation was tested by the response to insulin hypoglycemia while the antrum was being perfused with acid. It was found that gastric secretion of nervous origin (as represented by the response to insulin hypoglycemia) is not inhibited by the presence of acid in the antrum. Since the intestinal and nervous phases of gastric secretion are not inhibited by perfusion of the isolated antrum with acid, inhibition of the antral phase of gastric secretion would seemingly be due to direct interference with gastrin formation or release.

The effect on gastric secretion of acid applied to the duodenum was investigated in an animal prepared with a Heidenhain pouch and a Thiry-Vella fistula of

the duodenum. No inhibition of the secretion occurred from perfusion of the duodenum with acid solution.

Stimulation of the antrum by mechanical means was investigated. The isolated antrum with blood and nerve supply intact is promptly and strongly stimulated to release gastrin by mechanical distention. In one experiment the presence of acid in the antrum failed to inhibit this effect.

The effect of topical application of solutions of cocaine and atropine on antrum function was investigated. It was demonstrated that the local application of cocaine or atropine solutions to the antral mucosa interferes in some way with the liberation or formation of gastrin. The application of these substances to the main stomach pouch, on the other hand, fails to prevent the gastric secretory response obtained by the instillation of liver homogenate into the isolated antrum. The application of the same drugs to the mucosa of the isolated antrum does not prevent the secretory response to histamine. Cocainization of the mucosa of the isolated antrum does not block the nervous phase of gastric secretion.

From these experiments it appears that the nervous phase of gastric secretion is not dependent upon or mediated by a hormone liberated from the gastric antrum. —*John L. Lindquist, M.D.*

So Called Idiopathic Parenchymatous Gastric Hemorrhage (Zur Frage der sog. idiopathischen parenchymatoesen Magenblutung). G. E. KONJETZNY. *Chirurg*, 1955, 26: 1.

STUDIES covering a period of 35 years have enabled the author to demonstrate that acute gastroduodenitis frequently leads to the formation of erosions which may be responsible for hemorrhages of various degrees of severity. Before elucidation of the genesis of such conditions by the author, the term "primary idiopathic parenchymatous gastric hemorrhage" had been popular in the literature on this subject.

The classical symptoms of a peptic ulcer, hypersecretion, delayed emptying of the stomach, and occult or manifest hemorrhages are not pathognomonic for an ulcer. It follows that such history points to gastroduodenitis and justifies only a suspicion of ulcer. Gastric hemorrhage occurs with the same frequency in patients with gastritis or gastroduodenitis as in those with ulcer.

Erosions of the gastric mucosa may be demonstrated gastroscopically or in biopsies. It should be remembered that hemorrhages from the gastric mucosa may be due also to liver cirrhosis, essential thrombopenia, hemophilia, cholemia, miliary aneurysms, or bacterial gastric erosions complicating pneumonia. As a rule, erosive gastroduodenitis is not of bacterial origin.

The mechanism of massive, sometimes fatal, hemorrhages caused by inflammatory erosions remains obscure. The author rejects the importance of the spastic-atonic syndrome described by Muller and attributes the formation of erosions to a local process.

A gastric hemorrhage caused by erosive gastroduodenitis is not infrequently attributed to a bleeding ulcer, and the correct diagnosis is first made only after histologic examination of the resected stomach.

—*Joseph K. Narat, M.D.*

Gastric Neurinoma; Case Report (Su un caso di neurinoma dello stomaco). P. ASTORRI. *Arch. ital. mal. app. diger.*, 1954, 20: 403.

A 51 year old farmer had been having epigastric distress at irregular intervals for about 1 year, but not enough to cause him to stop working. About 1 month before admission he first noted a tumor. He was found to have a tumor mass in the left upper quadrant about the size of a tangerine. X-ray studies revealed what was considered to be an extragastric lesion. At operation he was found to have a pedunculated tumor mass arising from the stomach and lying in the gastrosplenic ligament. Histologic study revealed this to be a neurinoma, which was considered to have arisen from the plexus of Auerbach and Meissner.

A review of the literature is presented, and up to 1950 a total of 120 cases had been reported. The author prefers the term neurinoma to schwannoma, peripheral glioma, chitoneuroma, or lemmoma.

—*Lucian J. Fronduti, M.D.*

Diffuse Carcinoma of the Stomach and Linitis Plastica (Il carcinoma diffuso dello stomaco e la linite plastica). UGO GIGLI. *Arch. ital. chir.*, 1954, 78: 461.

THE AUTHOR does not believe that linitis plastica should be considered an entity with constant characteristics caused by a particular type of neoplasm or by an inflammatory process. The term linitis plastica should be used to express a particular histologic picture in which hypertrophy of the connective and muscular tissues is seen. The cause of this condition is nearly always an infiltrating type of carcinoma, but it may be another type of tumor or, more rarely, an inflammatory process.

When the process has infiltrated the entire stomach it takes on the appearance of a leather bottle. The clinical picture will vary with the cause, whereas the radiologic picture will be that of an infiltrating tumor, more or less extensive.

Treatment is surgical and the amount of resection is in direct proportion to the extent of the disease and, in general, total gastrectomy is to be preferred.

The author reports on 12 cases. Of these, 3 were inoperable. Total gastrectomy was performed in the remaining 9. Four of the operations were performed through an abdominal incision and the remaining 5 through a thoraco-lumbar approach.

Of the 3 inoperable patients, 2 died within 3 months and the other during the hospital stay. Seven of the patients operated upon died within a year, 2 soon after the operation. One patient considered to be luetic did not follow antiluetic therapy and shows clear signs of tertiary lues. The other surviving patient is well 7 months after the intervention.

—*Lucian J. Fronduti, M.D.*

The Treatment of Perforated Gastroduodenal Ulcers by Emergency Gastric Resection (La resezione gastrica d'urgenza nel trattamento dell'ulcera gastroduodenale perforata). G. CAVINA. *Arch. ital. chir.*, 1954, 78: 446.

THE FIRST gastric resection to be performed for a perforated ulcer was done by Keetly in 1899. Von Haberer (1919) had the merit of realizing that emergency gastric resection could not only be a life-saving

intervention but also a curative measure. Other pioneers in this philosophy were Eunike (1919), Massari (1920), Schwarzmann (1920), Hromada (1921), Pierre Duval (1924), and Yudine who, in the *J. Internat. Chir.*, during 1939, published a series of 937 resections performed in 1,438 cases of perforated ulcer with a mortality rate of only 8.9 per cent.

Considering the immediate results of the operation, it was thought that in general they were good. Despite the absence of preoperative preparation and the urgency of the procedure, the postoperative course was usually not different from that of an elective operation and often better. This apparent paradox is explained by the following facts. The patients with an acute perforation are generally in a good nutritional state and when seen early after the perforation they are not in a true state of shock. They present less technical difficulties than found during an elective operation during which there may be penetration of the lesion into the surrounding tissues. It is believed that the edema developing around a perforated ulcer facilitates the freeing and closure of the duodenal stump.

Through the years the mortality rates have decreased from 25 per cent of 84 resections in a series reported by Boger in 1929 to 5 per cent of 121 resections in another series reported by Saegesser in 1953. The author performed 47 resections among 75 cases of perforated ulcer between 1949 and 1953 without a single fatality. The usual cause of death was shock due to a lengthy operation or unsuitable patients.

The end results are often better than those obtained after an elective procedure. All of the author's resected cases were followed up. The results were considered good in 87.2 per cent of the 47 cases, mediocre in 12.7 per cent of the cases, and poor in none. These results were compared with those obtained in 23 patients of his series of 75 perforated ulcers in which a simple suture alone had been done. The results were considered good in 39 per cent of these 23 cases, mediocre in 30 per cent, and poor in 30 per cent. Six patients required a second operation. Later on, the author adds that the patients who were treated by simple suture presented *ab initio* an unfavorable picture which prompted this choice of treatment.

Although the results are better in patients with a long ulcer history and although it is debatable whether one is justified in performing a resection for the acute ulcer with perforation, the author still prefers a resection, believing that one can expect a higher percentage of good results than after a simple suture.

Cavina gives a short résumé of the various techniques of gastrectomy with their advantages and disadvantages. His preference goes to a retrocolic Hofmeister-Finsterer type of anastomosis.

In conclusion, the author stresses the fact that in his own mind there is no absolute superiority of one method over the other. It is a matter of judgment to decide which procedure is appropriate to a given case. On the one hand resection is not only a life-saving but also a curative measure, eliminating subsequent operations to a certain extent; its end results are at least comparable with those of an elective procedure and technically its realization is often less arduous. On the other hand, one is not justified in performing a resection if the perforation is more than 12 hours old or if the patient, due to his age or his having concomitant diseases, is a poor surgical risk. Local anatomical conditions such as a very high gastric, or a very low duodenal ulcer and marked soiling of the peritoneal cavity are also obvious contraindications. Above all, if the surgeon does not have the technical skill to perform a rapid operation or if he is not surrounded by a sound team, he should be loath to treat a patient with perforated ulcer by resection.

Cavina's series of 47 successful resections among 75 cases of perforated ulcer bears out his sound judgment in the selection of patients.—*René B. Menguy, M.D.*

Effects of Adrenocorticotropic Hormone (ACTH) and of Cortisone on Peptic Ulcer; Experimental Studies on Mann-Williamson Dogs. David J. Sandweiss, Schayel R. Scheinberg, and Harry C. Saltzstein. *Gastroenterology*, 1954, 27: 617.

The effects of ACTH and cortisone on Mann-Williamson ulcer in dogs were investigated. The operation was performed on 45 dogs. Nineteen were used as controls, 16 were treated with ACTH, and 10 were treated with cortisone.

The ACTH-treated dogs lived much longer than the untreated dogs. Fewer developed ulcer and ulcer complications, such as hemorrhage and perforation. Nine of the 16 ACTH-treated dogs lived longer than 165 days postoperatively. Only 1 of the untreated dogs lived longer than 165 days. Five of the 16 ACTH-treated dogs were found to have ulcer as compared with 14 of the 19 untreated dogs. Ulcer complications developed in 31 per cent of the ACTH-treated dogs as compared with 63 per cent of the untreated dogs. These complications occurred in 4 of the 5 ACTH-treated dogs that developed ulcer and in 12 of the 14 untreated dogs that developed ulcer.

The dogs treated with cortisone also lived longer than the untreated ones, but the incidence of ulcer and ulcer complications in the treated dogs was not significantly reduced. Five of the 10 cortisone-treated animals lived longer than 165 days as compared with one of the untreated animals. However, 70 per cent of the cortisone-treated animals had typical Mann-Williamson ulcers; 50 per cent died of perforation peritonitis as compared with 74 and 63 per cent respectively in the untreated animals.

There were no apparent harmful effects of ACTH and cortisone on the experimental dogs, even among those treated daily for as long as 5 or 6 months, nor among those treated with ACTH dosage twice as high as is generally recommended in human therapy. The experimental results appear to indicate that ACTH had a beneficial effect on both postoperative time and incidence of ulcer. With cortisone, beneficial effects were noted only in the postoperative survival time. It may be that ACTH, beyond stimulating production of cortisone, stimulates or inhibits the production of other hormones, which may be responsible for the better results obtained in the ACTH-treated Mann-Williamson dogs.

The results with ACTH and cortisone in these experimental animals suggest that further studies are needed on the relation of these and other hormones to the spontaneously occurring peptic ulcer in man.

—*Samuel Kahn, M.D.*

Hemorrhage from Primary Disease of the Mesenteric Small Intestine; Review of the Literature and Analysis of 216 Cases. GORDON MCHARDY, JOHN E. BECHTOLD, and ROBERT J. MCHARDY. *Gastroenterology*, 1955, 28: 17.

BLEEDING FROM THE SMALL INTESTINE distal to the duodenum is probably the rarest source of melena, and yet melena is the most frequent manifestation of disease of the small intestine. This report comprises an analysis of 216 cases of primary lesions of the mesenteric small intestine undertaken in an attempt to elucidate this phenomenon.

The small intestine distal to the duodenum was established as a primary bleeding site in 46 patients. Approximately half of the bleeding lesions were located in the jejunum and half in the ileum. Recurrent hemorrhage occurred in 35 per cent of the 46 bleeding patients and was most frequent in Meckel's diverticulum and hemangioma. A single bleeding episode was recorded in 65 per cent of the 46 patients. The cases making up this series are tabulated according to the primary disease, i.e., Meckel's diverticulum, non-Meckelian diverticulum, primary ulcer, regional enteritis, and neoplasms, and the literature on these subjects is reviewed.

The most frequent source of bleeding among the younger patients was Meckel's diverticulum and among older patients, neoplasm. Abdominal pain was the most prominent symptom, occurring in 89 per cent of the bleeding patients. A preoperative diagnosis was achieved in 65 per cent of the 46 bleeding patients as compared with 29 per cent of the entire 216 patients.

In the absence of obstruction or perforation, meticulous visualization of the small intestine is indicated even though roentgenographic examination has only limited value. Emergency operation in patients in whom the source of bleeding is undetermined is not to be recommended. An emergency is, however, created by obstruction, perforation, and mesenteric vascular occlusion. Curative resection may be accomplished in all benign and in most malignant neoplasms.

—*John L. Lindquist, M.D.*

Primary Diverticula of the Duodenum. JOHN M. WAUGH and EDWARD V. JOHNSTON. *Ann. Surg.*, 1955, 141: 193.

PRIMARY DIVERTICULA of the duodenum have been of interest to physicians and surgeons for a little more than four decades. Some of the original controversy regarding the ability of these diverticula to cause symptoms and the advisability of surgical treatment continues today.

The authors reviewed 30 cases of primary diverticulum of the duodenum in which surgical exploration was carried out at the Mayo Clinic in the period from January, 1940 through December, 1952. During this period the diagnosis of duodenal diverticulum was recorded by the clinicians in 525 instances. In addition, 205 secondary diverticula associated with peptic ulcers in the first portion of the duodenum were noted during this time.

The authors distinguished between primary and secondary diverticula as follows: primary duodenal diverticula are typical thin-walled outpouchings that occur almost entirely on the concave side of the duodenal curve, with no musculature in the wall of the sac; secondary diverticula are those which result from traction or scarring of local inflammatory processes or ulceration, and the wall of these sacs usually consists of all the normal layers of the bowel.

The incidence of primary diverticula in the duodenum is second only to diverticulosis of the colon. Autopsy studies have revealed diverticula in up to 14.5 per cent of careful duodenal dissections, while roentgenographic surveys have disclosed an incidence of only 1 or 2 per cent. The higher figure is probably closer to an accurate estimate for the adult population.

Duodenal diverticula occur more frequently in older persons. In the authors' series the ages ranged from 34 to 78 years, the largest number of patients being between 55 and 65 years of age. There is no significant difference in the sex distribution of these lesions. Diverticula are said to occur predominantly in the second or descending portion of the duodenum, near the ampulla of Vater.

Primary diverticula of the duodenum are associated with diverticula of the colon and the other parts of the small intestine. They are rarely the cause of symptoms, but the evaluation of symptoms complained of by patients found to harbor duodenal diverticula can be extremely difficult.

The authors found the results of operative treatment of primary diverticula of the duodenum disappointing in their series. Less than half of their patients on whom data were adequate for final evaluation were said to have obtained an excellent result.

Discussion on Modern Techniques in the Surgery of the Colon. FREDERICK A. COLLER and JOHN BRUCE. *Proc. R. Soc. M.*, Lond., 1954, 47: 1085.

THE AUTHORS review the present-day techniques in colon surgery, including preparation for operation and ancillary care.

Preoperative preparation in all its phases is highly important. In addition to the commonly employed measures of correcting protein, carbohydrate, protein and fluid depletion, blood volume deficits should be sought for and corrected. The value of preoperative bowel preparation in the presence of good nutritional balance and established principles of bowel surgery, is considered negligible. An anastomosis does not heal because it is in a sterile field, but because it has been done with minimal trauma, has a good blood supply, and is not under undue tension. Although the various sterilizing agents are used, too much reliance upon them as the determining factor in the success of the operation should not be made. Daily preoperative purges are not necessary; they may exhaust and dehydrate the patient. A soapsuds enema on the morning of operation will leave the bowel sufficiently clean so as not to interfere with the operation. In patients partially obstructed but not requiring surgical decompression as part of their preparation, more vigorous enemas and catharsis may rarely be needed.

Whether or not the ileocecal valve is competent, acute large bowel obstruction is a surgical emergency. Decompression by a long tube of the Miller-Abbott or Cantor type is not sufficient. Cecostomy or transverse colostomy is urgently indicated. If the ileocecal valve

is incompetent, the use of a long tube should be added to the surgical decompression.

The attitude of the patient toward his disease and operation has much to do with the rapidity of his recovery. A sense of optimism should be communicated from surgeon to patient, with full discussion of the possibility of an abdominal stoma.

Techniques for certain operative procedures are outlined. Coller recommends transverse incisions for all operations on the colon.

Best results with ileostomy are obtained by performing the maturation operation of Crile and Turnbull, and by the use of plastic disposable bags cemented to the skin in the immediate postoperative period.

Postoperatively the nasogastric suction tube is continued for a day or two until peristaltic sounds return or until gas is passed by rectum. Penicillin and streptomycin are employed to aid in preventing pulmonary and peritoneal infection.

In the discussion, John Bruce of Edinburgh pointed out that operations on the colon are undertaken with two main ends in view: (1) the relief of obstruction, and (2) the eradication of segmental or generalized disease.

In dealing with obstruction, intestinal tube suction and fluid and salt therapy under no circumstances should be regarded as a substitute for surgery. There is nothing to gain by postponing operation beyond the few hours necessary to improve the general state of the patient. A proximal colostomy is almost always advisable.

The first step in the operation should be to identify the distended transverse colon and to deflate it by needle and suction. Subsequent leakage from the needle site is no great problem. Proximal deflation of this type makes it easier to unwind a volvulus of the distal colon. Bruce believes it is safest to exteriorize and resect a volvulus of the sigmoid in order to prevent recurrence or subsequent mesenteric thrombosis, even if the colon appears viable. Redundancy makes this procedure easy.

Foreign bodies are best removed from the colon by a transverse incision proximal to the area of contact.

Obstructions due to malignancy are best dealt with by proximal colostomy and subsequently resection of the stoma and the obstructing lesion as a common segment. Cecostomy is unsatisfactory.

In operations for the extirpation of disease of the colon, the prime factors are wise placement of a generous incision, adequate mobilization of the bowel, gentleness of technique, and lack of tension on the anastomotic line.

In radical operations for diverticulitis, it is important to resect wide of the disease, so that the anastomosis is in normal tissue, and is without tension. Here, again, mobilization is emphasized. In the presence of a vesicocolic fistula or an unresolved abscess, it is wisest to abandon resection and institute proximal drainage. However, a bladder fistula should be detached, and the bladder carefully closed. Urinary drainage by indwelling catheter for 7 to 10 days is carried out. Colostomy in itself cannot be considered definitive treatment. It must be followed by resection in less than 3 months, or sooner if incapacitating symptoms persist.

In preparing patients for surgery for ulcerative colitis, amino acid infusions and cortisone in combination can promote a hopeless or a poor risk patient into one in whom the hazards of operation are insignificant. —*Harold Laufman, M.D.*

Subtotal Colectomy with Ileosigmoidostomy and Fulguration of Polyps in Retained Colon; Evaluation as a Method of Treatment of Polyposis (Adenomatosis) of the Colon. TILDEN C. EVERSON and MAX J. ALLEN. *Arch. Surg.*, 1954, 69: 806.

THE ATTEMPT to preserve anal function and prevent the development of incurable colonic carcinoma from multiple polyposis is commendable, with certain limitations. The procedure of subtotal colectomy and ileosigmoidostomy is favored when the rectum and rectosigmoid are free of cancer, when only few and scattered polyps are present, and when the patient is co-operative in a permanent follow-up. In cases not fulfilling these criteria, total colectomy with removal of the rectum is recommended. The ability to follow with care and certainty a willing patient is a factor of utmost importance.

In the present report, 122 cases have been culled from the American literature. In this group of patients, 12 died of colon carcinoma some time after subtotal colectomy and ileosigmoidostomy. In nearly half of these cases cancers developed in polyps which appeared in the remaining lower colon during long periods when follow-up examinations were not performed. It would appear then, from published cases, that about 5 per cent of patients develop carcinoma of the colon in spite of good follow-up examinations. That risk does not seem to the authors to be unfavorable in face of the advantage of preserving anal function. They suggest that the percentage may be reduced by more faithful and more frequent follow-up treatments. Further, it is suggested that by placing the anastomosis between the ileum and the rectosigmoid at a lower level than that heretofore customary (20–30 cm. above the anus), the remaining colon may be inspected more thoroughly. The authors prefer an anastomosis at the pelvic peritoneal reflection, about 15 cm. from the anus.

—*Leonard D. Rosenman, M.D.*

Twelve Cases of Prolapse of the Rectum Treated by the Roscoe Graham Operation. BJÖRN SNELLMAN. *Acta chir. scand.*, 1954, 108: 261.

THE AUTHOR presents 12 cases of prolapse of the rectum in which he used the Roscoe Graham method for closing the hernial opening.

Prolapse of the rectum is defined by the author as the condition in which the rectogenital fossa, filled with intestine (small intestine or colon) and pushing the anterior rectal wall in front of it, bulges out through the anus. The peritoneum-covered rectogenital fossa constitutes the hernial sac, while the defect in the rectogenital septum, either primary or secondary, accompanied with bursting and weakening of the levator muscles (especially the puborectalis), forms a hernial orifice.

A deep rectogenital fossa, or enterocele (a preliminary stage of rectal prolapse) is a congenital malformation consisting in a weakness in, or incomplete

fusion of, the two peritoneal layers in the caudal part of the pelvis. The author believes that enterocele often causes rectal obstruction of the valvular type, as well as pains and anal bleeding due to the defecation difficulties. Enterocele progresses and finally becomes a rectal prolapse and can be diagnosed by roentgenographic examination carried out during straining.

In most cases of prolapse of the rectum the intestine falls down and the patients complain of a slimy, blood-stained discharge and in some cases of incontinence. The author reports that one of his patients, an unmarried childless woman aged 45, had not herself observed any prolapse but she had noticed bleeding, a mucus discharge from the anal opening, cramplike pains in the sacral region, and difficulty in passing her stools. She had been operated on once for hemorrhoids. Rectal palpation revealed a constricted anal orifice, hardly allowing the passage of a forefinger. Proctoscopy showed severe inflammation and a mucus coating in the rectum. When the patient sat and strained hard a walnut-sized segment of the rectal wall protruded through the anus. Roentgen examination revealed that the patient had a large enterocele. The only slight protrusion, was believed to be due to the presence of a cicatricial formation following the operation for hemorrhoids. After the Graham operation, the bleeding, mucus discharge, and defecation difficulties disappeared and the rectal mucous membrane gradually resumed its normal rectoscopic appearance.

The 12 patients were prepared for 4 to 5 days by laxatives and lavage and with a sulfa preparation and streptomycin per os. Spinal anesthesia was used in the majority of cases. The 2 oldest patients received narcosis. Laparotomy was done through transverse or longitudinal incisions below the umbilicus. The peritoneum at the bottom of the deep rectogenital fossa was divided and the rectum and vagina freed by blunt dissection. The levator muscles were sewed together in the median line between the rectum and the vagina by means of strong silk or nylon sutures which were firmly attached in both the fascia and the muscle plate. The levator sutures were inserted inferiorly and anteriorly. Toward the upper posterior aspect, room was left for the rectum. In most cases, 3 or 4 sutures were needed. Above the levator sutures the peritoneum and uterosacral ligaments were united in the median line, and the remainder of the rectogenital fossa was obliterated by tobacco-pouch sutures in the peritoneum. At the level of the third or second sacral vertebra, the peritoneum was in most cases so tense that no more sutures could be inserted. To avoid the formation of pockets which might incarcerate the small intestine, the author found it necessary, when obliterating the rectogenital fossa, to include the wall of the rectum.

Glucose and salt solutions were given postoperatively and the stomach aspirated when necessary. A mild laxative, in most instances paraffin, was given when the patients began eating again.

The author found that the Graham operation was easy to perform in every instance and the after course was uneventful despite the fact that some of the patients were elderly. The patients were able to get up soon after the operation and began to defecate at an early stage without any discomfort.

The continence was good in all cases but 2, in which the observation time had not yet reached 6 months. The author believes that for satisfactory sphincteric function, it is important that none of the intestine be removed at the Graham operation. Excision of intestine cannot prevent a recurrence and can be said to be contraindicated in rectal prolapse. No recurrences have been seen, but the observation times have been short. —*Alan L. Dorian, M.D.*

Rectal Strictures of Lymphogranuloma Venereum; Some Observations from a 5 Year Study of Treatment with the Broad Spectrum Antibiotics. LEON BANOV, JR. *Am. J. Surg.*, 1954, 88: 761.

LYMPHOGRANULOMA VENEREUM is an infectious disease caused by a virus and transmitted venereally. It has many clinical manifestations, of which the anorectal lesions are most important because they may produce severe structural damage. These lesions are characterized by 4 factors: chronicity, infectiousness, insidiousness, and threat to life. Serious complications often occur: intestinal obstruction due to rectal stricture, epidermoid carcinoma, and death from inanition.

Prior to the advent of the broad spectrum antibiotics, the treatment of these rectal strictures was a discouraging problem, because it was prolonged, difficult, hazardous, and uncertain. The introduction of the antibiotics has significantly changed the management of these cases. The action of the antibiotics is directed toward the inflammatory component of the rectal stricture. The drugs have no known effect on scar tissue. By reducing the inflammatory edema of the rectal stricture, the drug produces an increase in the size of the rectal lumen.

Since there are no laboratory criteria for determining the adequacy of treatment of the individual case, the following clinical criteria have been evolved: absence of rectal bleeding, diminution of straining at stool, reduction of pain on defecation, absence of mucus and purulent exudate from the rectum, smooth, gray appearance of the rectal wall and stricture, and apparent evidence of a larger lumen in the rectal stricture.

Serial quantitative complement fixation tests do not appear to be reliable indices for determining the adequacy of the treatment or the need for treatment. Objective evidence of improvement was found in most patients treated by the broad spectrum antibiotics.
—*Samuel Kahn, M.D.*

The Management of Accidental Injuries and Deliberate Resections of the Ureter During Excision of the Rectum. J. W. GRAHAM and J. C. GOLIGHER. *Brit. J. Surg.*, 1954, 42: 151.

THE AUTHORS discuss their experiences with 32 patients in whom either accidental or deliberate resections of one or both ureters occurred during surgery for cancer of the rectum.

One thousand six hundred and five patients were exposed to the risk of ureteral injury and in 14 patients the 15 ureters were divided, a total incidence of 0.93 per cent. The common sites of injury were at the level of the ligation of the inferior mesenteric vessels on the left side and just above the lateral ligaments of the rectum on either side. The latter was the more

common site. Most injuries occurred in patients in whom the growth had extended and become adherent to the ureter. Deliberate resections were done when necessary to permit radical removal, or when complete pelvic clearance was undertaken. There were 11 such cases. Most of the ureteral resections (13) occurred during the usual combined abdominoperineal resection of the rectum. Only 2 injuries occurred, one in perineoabdominal excision and one in anterior resection.

Two suggestions are offered in the prevention of such ureteral injury. Identification of the left ureter at the time of the peritoneal incision and lateral and backward displacement before any further procedure is done, which is considered very necessary. Exposure of the ureter on both sides from the brim of the pelvis downward to almost the bladder, with outward retraction, should be done in trying to prevent injury at the level of the lateral ligaments of the rectum.

The methods of treatment of ureteral resection were as follows: (1) simple ligature of both cut ends of the ureter (8 ureters), (2) end-to-end anastomosis at the site of section (6 ureters), (3) suture of partially divided ureter (2 ureters), (4) substitution of a segment of ileum for the resected segment of ureter (3 ureters), (5) implantation of the proximal cut end of a ureter into the bladder (4 ureters), (6) implantation into the colon (10 ureters), (7) cutaneous ureterostomy (1 ureter), and (8) no treatment (1 ureter).

All methods of treatment are illustrated and brief case reports, including the results, are presented.

The most successful method of management was that of implantation of the proximal end of the ureter into the bladder. It gave the patient a relatively normal urinary tract without fistula or distressing urinary symptoms. Unfortunately, it was not feasible in patients in whom the resection was at a high level in the ureter. End-to-end anastomosis of the ureter was unsuccessful in all instances. It is not at present advocated as a method of treatment by the authors. The formation of an ileal segment to replace the resected ureter was also unsuccessful and the writers were discouraged with it. In patients with high resection of the ureter or with complete pelvic clearance, anastomosis into the bowel—either the ileum or colon—was reasonably adequate.

However, in cases of unilateral division, with reasonable assurance that the opposite kidney, ureter, and bladder are normal, the authors believe that the sacrifice of renal function on the injured side should be entertained. Simple ligation of both ends of the ureter are therefore advocated. Experience showed that fistulas, hydronephrosis, and infection followed this method of treatment but the patient survived and these conditions were controlled by later nephrectomy at a time when the patient could withstand the procedure. —*Donald C. Geist, M.D.*

Squamous Cell Carcinoma of the Anus; Results of Treatment. EDWARD S. JUDD, JR., and BURLEIGH E. DETAR, JR. *Surgery*, 1955, 37: 220.

SQUAMOUS CELL CARCINOMA of the anus is a rare lesion but one encountered frequently enough to present a very definite problem to the surgeon. The nature of adenocarcinoma in the lower part of the rectum is much better understood, and the treatment for that lesion appears to be well documented and familiar to all. Up to the present, however, the situation is anything but stable in regard to squamous cell epitheliomas.

A general dissatisfaction with nearly all forms of therapy came over the entire profession in relatively recent times. Some controversy seems apparent in reading reports presented by surgeons, proctologists, internists, and radiotherapists. In turning to the reports which have been presented in more modern times the authors had hoped to develop some idea on the comparable effects of the several methods of treatment still in practice in various centers. However, the results have been somewhat disappointing.

The authors then endeavored to determine what situation has held true in their institution in relatively modern times. They immediately encountered the difficulty of a mixture of treatments, which all other investigators had also found to be the case, but they have attempted to derive at least some information for future guidance. They studied a series of 122 consecutive cases of squamous cell carcinoma of the anus seen at the Mayo Clinic during a period which they arbitrarily terminated in 1948. This gave at least a 5 year follow-up period for every patient.

As a result of their entire study they concluded that squamous cell epithelioma of the anus still remains a problem in proper management. In general the record in this regard is not brilliant. Surgeons should discard local excision except in extremely isolated instances. Unwarranted enthusiasm for radium and x-ray therapy has led in the past to loss of valuable treatment time for some patients. Poor survival statistics associated with some of the earlier radical operations are due to the late date at which surgical consultation has been sought, after other means have failed. Radical resection in very early cases has been followed by satisfactory survival rates.

On a purely theoretical basis, radical resection should be coupled with bilateral dissection of the inguinal lymph nodes. On a practical basis, there is not enough cumulative evidence to prove this, since some patients appear cured without dissection, but none of the patients with proved inguinal metastasis whose cases were studied survived for 5 years after such dissection.

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

The Diagnosis and Management of Biliary Tract Disease. ROBERT M. ZOLLINGER, THOMAS BOLES, and GLENN B. CRAWFORD. *N. England J. M.*, 1955, 252: 203.

THE AUTHORS present the principles of management of biliary tract disease, including the complications of acute cholecystitis and common duct stone, as practiced by the Department of Surgery, Ohio State University College of Medicine.

An analysis was made of 676 records of patients operated upon during the period between 1948 and 1953 for biliary tract disease. In spite of the high accuracy of diagnosis in biliary tract disease with the use of cholecystography, procrastination by the patient or physician, among other causes, contributed to the

findings of common duct calculi in 17 per cent, acute cholecystitis in 15 per cent, and pancreatitis, either alone or as a further complication, in 7 per cent of these cases. The positive demonstration of stones with cholecystography is an ideal finding on which to base a recommendation for operation, and nonvisualization after proper confirmation is satisfactory in the selection of patients for surgery; other findings, however, such as poor filling, abnormal size and shape, and poor emptying are not sufficient evidence of disease. Gallstones should be recovered in almost every patient subjected to cholecystectomy if the best results are to be obtained.

Proof or suspicion of cardiac disease, including previous coronary thrombosis, does not alter the surgical indications in recurrent gallstone colic, in suspected common duct stone, or in acute cholecystitis. The detection of silent gallstones warrants the recommendation of cholecystectomy in the patient who has duodenal ulcer or has had one or more attacks of pancreatitis, or has symptoms of recurrent cardiac origin. A conservative attitude is justified in patients over 70, but a firm policy in favor of surgery is taken in younger patients in view of the possible complications of common duct obstruction, acute cholecystitis, or pancreatitis.

Patients with acute cholecystitis are managed in the hospital by correcting their dehydration, using nasogastric suction if vomiting continues, and demerol and atropine for the relief of pain. Antibiotic therapy is given to protect against infection. The response to these measures is judged by close, repeated observations, including the abdominal findings, the white cell count, the pulse and temperature chart, and the narcotic requirement. If the clinical course is one of continued and sustained improvement, operation is deferred until the patient is ambulatory and taking a normal diet. Surgery in this group is scheduled and performed several days or a week after admission to the hospital, in contrast to the policy of sending them home to return in several months for an elective procedure after the acute process has subsided. However, if the patient fails to improve on conservative measures, suffers a flare-up after initial improvement, or has increasingly severe manifestations, an emergency, off-schedule operation is indicated. Cholecystostomy is performed usually in the elderly patient with a palpable mass, and when technical difficulties or a large abscess is encountered at the time of surgery.

Common duct stone is frequently overlooked and a cause for a second operation. Jaundice, enlargement of the common and cystic ducts, small stones in the gallbladder, evidence of past or recent pancreatitis, and secondary biliary tract operations are indications for exploration of the common duct. The recovery of approximately twice as many common duct calculi in patients over 60 years of age as in those under that age is compelling evidence for earlier surgery in gallbladder disease.

Preoperative management of the jaundiced patient, with emphasis on dietary preparation and replacement of blood volume deficits (20 to 30 per cent), is essential in assuring a low mortality.

The authors' technique of cholecystectomy is described: the gallbladder is removed from the fundus downward, the peritoneum being incised about 1 cm. from the liver margin; the ampulla of the gallbladder is dissected free from the common duct; after this the gallbladder is peeled from its bed until it tends to hang from the upper peritoneal attachment as if a mesentery had been developed.

—*Edwin J. Pulaski, M.D.*

Prevention of Portal Death by Means of Hypothermia; an Experimental Study. I. CSILLAG, H. JELLINEK, and E. EGEDY. *Acta morph. Acad. Sc. Hungaricae*, 1954, 4: Supp.

LIGATION of the portal vein for 30 minutes or longer is invariably fatal in man and in the experimental animal. Surgical problems involving temporary occlusion of the portal vein would be overcome if a more prolonged occlusion could be tolerated. The successful use of hypothermia in cardiac surgery and in experimental vena caval occlusions suggested this study.

In the first of three series the portal vein was ligated for 20 to 40 minutes in dogs. All of the animals died.

In the second series the pulse, blood pressure, and electrocardiographic changes were recorded during portal occlusion in 9 dogs. In 4 of these with continuous occlusions, the blood pressure decreased to zero and death occurred in 31 to 55 minutes. Electrocardiographic signs of cardiac failure were prominent in the last 5 to 10 minutes. In 5 dogs, the portal clamp was released after 15 to 32 minutes and there was a temporary rise of the blood pressure, followed by secondary collapse and death. In all 9 animals, there was gross and microscopic hemorrhagic infarction of the intestines, with congestion and lesser hemorrhages in the stomach wall, spleen, and kidneys.

In the third series, the body temperatures of 7 anesthetized dogs were decreased to from 23 to 28 degrees C. and the portal vein was clamped for 45 to 51 minutes. The electrocardiographic changes were minimal during the period of occlusion. All animals survived this procedure and were able to walk about a few hours after rewarming and could eat normally the following day. Dogs were sacrificed in from 1 hour to 90 days after rewarming. In contrast to the first two series, the 7 hypothermic dogs exhibited a normal intestinal wall structure without infarction. In a few, there was marked congestion, and in 1 a few slight hemorrhages were observed in the intestinal follicles. The intestinal lymphatics were dilated.

—*Stanley W. Tuell, M.D.*

The Surgical Treatment of Portal Hypertension. CARL-AXEL EKMAN and PHILIP SANDBLOM. *Acta chir. scand.*, 1954, 108: 241.

THE AUTHORS present an excellent over-all review of the surgical treatment of portal hypertension. Also presented in some detail is a personal series of 43 cases —19 of extrahepatic and 24 of intrahepatic block. This series of cases and their management do not differ substantially from those prevalent in the United States today.

The authors use portal venography (percutaneous splenic puncture) as a routine procedure both preoperatively and postoperatively, and find it a great help not only in diagnosis but also in evaluating the success of the operative procedure. Splenorenal anasto-

mosis gave almost 80 per cent good results in the 9 cases in which it could be performed under extrahepatic block, while portocaval anastomosis gave 50 per cent good results in 14 cases under intrahepatic block. Only 1 of these patients bled postoperatively.

In conclusion the authors believe the shunt procedures are physiological, and the procedures of choice in portal hypertension. —*John C. Carlisle, M.D.*

Right Hepatolobectomy for Primary Mesenchymoma of the Liver. W. S. LORIMER, JR. *Ann. Surg.*, 1955, 141: 246.

THE AUTHOR reports a case of primary malignant mesenchymoma of the liver in a 15 year old girl, which was successfully removed by a hepatolobectomy. He also discusses the pathologic characteristics and clinical behavior of tumors falling into this classification.

He states that an attempt should be made to remove all solitary primary liver tumors regardless of their size, unless obvious posthepatic malignant infiltration is present or remote metastases can be demonstrated.

The surgical technique for proper hepatolobectomy consists in dissecting out and carefully ligating the blood supply to the portion of liver to be removed. By such an approach excessive bleeding is not encountered, and there is no need for the use of tourniquets, over-lapping mattress sutures, or cautery. In the case reported the tumor involved the right lobe, and after the right hepatic artery and first branch of the portal vein were ligated the lobe was transected with a minimal amount of bleeding.

—*Ely Elliott Lazarus, M.D.*

A Correlative Study of the External Pancreatic Secretion, the Plasma Antithrombin Titer, the Blood Amylase Concentration, and the Serum Mucoprotein Level in Patients With and Without Pancreatic Disease. DAVID A. DREILING, EZRA M. GREENSPAN, and MARTIN SANDERS. *Gastroenterology*, 1954, 27: 755.

THE PRESENT STUDY is an investigation to determine the clinical significance of the antithrombin titer in the diagnosis of pancreatic disease and to explore the possible relationship between the antithrombin titer, the external pancreatic secretion, the blood amylase levels, and the serum mucoprotein levels. Simultaneous studies of these factors were carried out in 49 patients without pancreatic disease and in 30 patients with proved pancreatic disorders.

In the control series of 49 patients without pancreatic disease the secretin test responses were all normal and there were no elevated serum amylase levels. The antithrombin titers were normal in 37 of the 49 patients, low in 6, and high in 6. Among these 49 patients there were 10 with high and 3 with low serum mucoprotein levels. The direction of variation of the mucoprotein level does not parallel that observed among the antithrombin titers.

Among the 30 patients with proved pancreatic disease there were only 3 with normal secretin tests. These 3 patients all had acute pancreatitis. High blood amylase values were observed only in 5 patients, all of whom had acute pancreatitis. The antithrombin titers were normal in 17, low in 3, and high in 10 patients with proved pancreatic disease. Mucoprotein levels were normal in 15, low in 3, and high in 12 patients with pancreatic disease.

No definite correlation was observed between the factors studied. Although increased serum mucoprotein and antithrombin levels occurred in about half the patients with pancreatic disease, the antithrombin elevations were not related to the increase in serum mucoprotein. The antithrombin titer was abnormal in a significant percentage (25 per cent) of patients without pancreatic disease and normal in half of 30 patients with proved pancreatic disorders. In the diagnosis of pancreatic cancer and chronic pancreatitis the secretin test has greater value than the serum amylase and antithrombin titer. The latter determination may be of assistance in patients with acute pancreatitis in whom testing with secretin is not clinically feasible. —*John L. Lindquist, M.D.*

Experimental Confirmation of the Anaphylactic Theory of Acute Pancreatic Necrosis (Conferme sperimentali all'ipotesi della genesi allergica della necrosi acuta del pancreas). MANLIO MANCUSO and ALESSANDRO PESCI. *Policlinico, sez. chir.*, 1954, 61: 337.

THE AUTHORS review the literature on the production of pancreatitis in the experimental animal. They believe that the anaphylactic theory of pancreatitis as first suggested by Couvelaire and Bargeton offers the best explanation for the manifestations of this condition.

Their personal research was carried out in 20 animals which were divided into 5 groups.

Five cubic centimeters of horse serum were injected twice into the substance of the pancreatic gland in 3 animals in the first group. The second injection was made after a 20 day interval. In all 3 animals the challenging injection was followed by the appearance of hyperemia and focal hemorrhage of the pancreas. In 1 control animal normal saline solution was given as a preparing injection and the challenging injection was without effect.

Three animals in the second group were sensitized by the injection of 10 c.c. of serum into the femoral vein. Twenty days later during digestion 5 c.c. of serum were injected into a pancreaticoduodenal vein and 3 c.c. of serum were injected into the substance of the pancreas. The rapid appearance of parenchymatous hemorrhage was observed. No lesions were seen in the fourth control animal which received normal saline solution instead of serum as a preparing injection.

In 4 animals in the third group, serum was injected twice into a mesenteric vein at 21 day intervals. The challenging injection was followed by severe shock, and pancreatic hyperemia was noted at autopsy.

Serum was injected into the 4 animals in the fourth group in the same manner as in the third group, but in addition the challenging injection was preceded by the administration of doryl and morphine. Marked pancreatic hyperemia was noted. No lesions were noted in the control animal receiving doryl and morphine alone.

A severe histaminic shock was produced in the 4 animals of the fifth group. In addition, in 2 of the animals 500 gammas of histamine were injected into a pancreaticoduodenal vein followed by ligation of the vein. In these 2 animals areas of hemorrhagic necrosis were found in the pancreas at autopsy.

In summary, hemorrhagic necrosis was found in the animals of the first and second groups and in the 2 animals of the fifth group which received histamine directly into a pancreaticoduodenal vein. In the other animals varying degrees of pancreatic hyperemia were noted. Fat necrosis was not found in any of the animals.

Microscopically, varying degrees of interlobular and intralobular hemorrhage with occasional disruption of the lobular architecture were found along with interstitial edema. Focal areas of cellular necrosis (without inflammatory replacement) were seen. The islets did not appear to be involved.

The authors conclude that acute hemorrhagic pancreatitis can be considered as belonging to the group of conditions of allergic origin.

—*René B. Menguy, M.D.*

MISCELLANEOUS

Classification of Retroperitoneal Tumors as a Guide in Clinical Diagnosis. WILLIAM J. ENGEL. *Arch. Surg.*, 1955, 70: 156.

ALL RETROPERITONEAL TUMORS fall into one of three broad categories: (1) primary unattached tumors, (2) tumors arising in organs normally present in the retroperitoneal space, and (3) primary or metastatic tumors involving the retroperitoneal lymph nodes. To classify any given tumor clinically into one of these three groups requires x-ray study, particularly by means of intravenous or retrograde pyelography, and often other special methods as well. Frequently it is possible to separate these tumors into one of these three broad groups; however, some of the subgroups may be correctly identified.

The primary unattached retroperitoneal tumors, once considered rare, have been reported in such numbers that they can no longer be so regarded. They may be benign or malignant; solid, cystic, or both; single or multiple; and of varied histologic type. Recurrence following surgical removal is common, and a tumor orginally regarded as benign may recur as a malignant tumor.

Tumors arising from organs normally present in the retroperitoneal space are of kidney or adrenal origin. Kidney tumors of various types constitute the largest group of retroperitoneal tumors, whereas tumors of the adrenal are logically divided into those which arise from (1) the medulla, and (2) the cortex. As a cause of retroperitoneal tumor mass, primary tumors of the lymph nodes are uncommon, and it is even rarer for them to appear clinically and remain localized to the retroperitoneal nodes. More commonly the disease involves all the lymph nodes; however, involvement of the retroperitoneal nodes may dominate the clinical picture. These tumors may be of any of the types indicated in the classification.

—*Stephen A. Zieman, M.D.*

GYNECOLOGY

UTERUS

Cervical and Endometrial Lesions in Uteri Removed Because of Benign Affections of the Corpus (Sulle lesioni cervicali ed endometriali in uteri asportati per affezioni benigne del corpo). UGO NARDUCCI. *Minerva gin.*, Tor., 1954, 6: 767.

IN 140 PATIENTS a hysterectomy was done for benign affections of the uterus (fibromyoma, fibrosis, metritis). The operation in every instance was total hysterectomy and was followed by selective biopsies of whole thickness fragments of the mucosae of the portio and corpus uteri. For purposes of selection the entire mucosa of the lining of the cervical canal, and, with the curette, the entire endometrium were removed. When no morbid changes could be found, numerous biopsies were carried out along the junction of the squamous cylindrical cells of the cervix.

In the reporting of this material the classification of Dellepiane was adhered to. There were observed 42 instances (30 per cent) of so-called normal epithelium and 98 instances (70 per cent) of so-called anomalous epithelium. Normal epithelium was found in 41 cases of physiologic transformation, which were further subdivided into 10 cases of ectopia, with a single layer of cylindrical epithelium on the external aspect of the cervix, and 31 cases of physiologic regeneration, or with regenerative phenomena in the squamous layer. Anomalous epithelium was found in 25 cases of pathologic transformation. These cases were further divided into a group of 14 with abnormal epithelium, or abnormal stratification with loss of the stratum of polygonal cells, with or without extension of the stratum of spinous cells, and with frequent parakeratosis or cornification; 6 with evident increase in the thickness of the epithelial layer as a whole, with various grades of polymorphism either of the cell itself or of its nucleus, and slight alteration of the nuclear-cytoplasmic ratio; 2 with atypical epithelium, or complete disappearance of normal stratification of the epithelium and complete loss of normal structure, with evident tendency on the part of the superficial epithelial cells toward leucoplasia with epithelial pearls, marked increase in the number of mitoses in all of the strata, and grave alteration in the nuclear-cytoplasmic ratio; 2 with carcinoma in the so-called O-stage; and, finally, 1 with microcarcinoma.

These findings apply only to the external cervical findings. Of the findings in the cervical canal there were listed 48 instances of normal mucosa; 82 of hyperplastic mucosa, including 5 of neoplastic hyperplasia in the sense of Amreich, Gusberg, Hertig, and Sommer; 1 of adenocarcinoma; and 9 of inflammatory processes. The findings in the endometrium were listed as normal in 71 cases (51 cases in the proliferative phase and 20 in the secreting phase). There were 69 cases of mucosal hyperplasia, and 6 of neoplastic hyperplasia.

It is seen that 2.84 per cent of these cases showed undiagnosed cancer; and to this percentage must be added that of the precancerous lesions. The finding of a normal epithelium in this group was relatively rare.

The author concludes that even in the presence of normal mucosa, total removal of the uterus will eliminate the possibility of secondary neoplastic change in the cervical stump. —*John W. Brennan, M.D.*

Clinicostatistical Data on Cases of Fibroma and Carcinoma of the Uterus in the Obstetric and Gynecologic Clinic of L. Mangiagalli of Milan in the Years from 1928 to 1952 (Rilievi clinico-statistici sui casi de fibroma e carcinoma dell'utero nelle ricoverate presso la Clinica Ostetrico-Ginecologica 'L. Mangiagalli" de Milano negli anni 1928–1952). MARIO GOISIS and MARIO FERRUZZI. *Ann. ostet. gin.*, 1954, 76: 767.

AMONG THE 64,105 gynecological admissions to the Mangiagalli clinic in the period from 1928 to 1952, there were 8,075 instances of uterine fibroma and 2,195 of genital cancer.

In the fibroma cases no evident correlation could be found between the age at the onset of menses and the development of the fibromatous condition. In 5,340 patients the menstrual periods were always regular in appearance and normal with regard to quantity and duration; in 1,638 patients there had been a rather uniform history of hypermenorrhea. The latter figure suggests a relationship between the hypermenorrhea and the fibromatous process, and seems to support the hyperhormonal theory of Seitz. In these cases there was a noticeable preponderance of pluriparae over nulliparae. At the time of diagnosis the majority of the patients were between 30 and 50 years of age.

The 2,105 cancers in this material may be divided into 1,142 (54.25 per cent) instances of cancer of the portio, 532 (25.27 per cent) instances of cancer of the cervical canal, and 431 instances of cancer of the uterine corpus. As with the fibromas the age of the patient at the time of the onset of the menses seemed to have no relation to the onset of the carcinomatous process. Here the number of patients giving a history of menstrual irregularities was insignificant; 1,663 of the 2,105 patients gave an absolutely normal menstrual history. There were 1,812 multiparous women as compared with 293 nulliparae. The earliest diagnoses were made in the carcinomas of the portio, the next most early were in cases of carcinoma of the cervical canal; the greatest delay was in the carcinomas of the corpus. The uterine carcinomas showed a progressive increase with increase of age.

—*John W. Brennan, M.D.*

Carcinoma of the Cervix Uteri Treated at the American Oncologic Hospital, 1929–1949. GEORGE A. HAHN. *Am. J. Obst. Gyn.*, 1955, 69: 48.

THE AUTHOR PRESENTS 319 cases of carcinoma of the cervix which were seen and/or treated by irradiation at the American Oncologic Hospital from January 1, 1929 to January 1, 1949, with a follow-up of 95 per cent. Eighty-five per cent of the patients were parous

and 32.6 per cent were 40 years of age or younger. Abnormal vaginal bleeding was by far the most prominent symptom. Twenty and eight-tenths per cent of the patients had previous pelvic surgery. The author recommends more frequent use of diagnostic curettage and circular cervical biopsy whenever pelvic surgery is to be done.

There was a 5 year survival rate of 26.3 per cent for the 288 patients treated in the 20 year period from 1929 to 1949. The importance of complete abdominal hysterectomy or other adequate treatment of the cervix was stressed. Serious postradiation complications developed in 3.5 per cent of the cases. Thirty-three patients (11.5 per cent) required posttreatment surgery.

Interesting metastatic foci were described and the possibility of remote metastases was emphasized even when there was no clinical evidence of local pelvic disease. —*Charles Baron, M.D.*

Extended Abdominal Hysterectomy with Pelvic Lymphadenectomy for Carcinoma of the Cervix; The Okabayashi Operation and Its Improved Techniques. HIDEO YAGI. *Am. J. Obst.*, 1955, 69: 33.

THE MAIN FEATURES of the Okabayashi operation are outlined as follows:

1. The posterior procedures, such as isolation of the rectum and resection of the cardinal and the uterosacral ligaments, are done prior to the anterior procedures. The better exposure of the cervix, bladder, and their surrounding areas makes possible an easier anterior manipulation.

2. Separation of the vesical part of the ureter and the lateral part of the bladder is systematic and with minimal bleeding.

3. Removal of the pelvic lymph nodes is also systematic and complete.

These are the main points which distinguish this operation from Wertheim's. From 1935 to 1952 the author has performed this operation in a total of 1,081 cases.

The operation is indicated in patients with stage I and stage II cancer, who are under 60 years of age.

One normal ovary in patients between the ages of 30 and 50 (both normal ovaries in the case of a young patient below the age of 30) is removed for later transplantation to the rectus muscle. The ovaries are placed in a saline-soaked gauze pouch which is kept at body temperature in the iliac fossa during operation. Abnormal and atrophic ovaries are not used.

Radiation therapy is begun about the third week after operation in all cases as a prophylaxis against recurrence. —*Charles Baron, M.D.*

Radical Hysterectomy and Pelvic Lymphadenectomy; A Review of 473 Cases Including 244 for Primary Invasive Carcinoma of the Cervix. WINIFRED LIU and JOE V. MEIGS. *Am. J. Obst. Gyn.*, 1955, 69: 1.

THIS PRESENTATION is based on 473 cases of radical hysterectomy with pelvic lymphadenectomy performed by the staffs of the Vincent Memorial Hospital, the Massachusetts General Hospital, the Palmer Memorial Hospital, and the Pondville Hospital (the Massachusetts Department of Public Health) during a period of 15 years, from February, 1939 to December, 1953. The material is presented in two parts: general information on patients who had radical hysterectomy with pelvic lymphadenectomy and information on patients having carcinoma of the cervix who were treated with radical hysterectomy.

The entire series of 473 cases of primary squamous cell carcinoma of the cervix included 27 cases of primary adenocarcinoma of the cervix, 1 case of cellular carcinoma of the corpus, 5 cases of primary carcinoma of the vagina, 24 cases of recurrent or residual carcinoma of the uterus (18 were squamous cell carcinomas of the cervix and 3 were adenocarcinomas of the corpus), 34 cases of carcinoma in situ of the cervix, and 24 referred cases in which cancer was found in the preliminary biopsy but there was no malignancy in the surgical specimen.

Surgical complications occurred in 24 per cent of the patients, and the operative mortality was 1.7 per cent.

Fistula formation as an operative complication occurred in 45 patients, an incidence of 9 per cent, and 35 of the fistulas involved the ureter. Thirteen (46 per cent) of the 28 uncomplicated ureterovaginal fistulas healed spontaneously within periods of between 1 and 10 months. Of the 13 patients, 3 had functional preservation of the involved kidney (after repeated ureteral dilatations in 1, after reimplantation of ureter into the bladder in 1, and in 1 patient no surgical intervention was attempted.

The value of radical hysterectomy with pelvic lymphadenectomy for carcinoma of the corpus is yet to be determined. The present series is regarded as an experiment that takes on added interest from the finding that there was lymph node metastasis in 23 per cent of the 47 cases.

There were 344 cases of primary invasive carcinoma of the cervix in this series. The number included 231 stage I, 109 stage II, and 4 stage III cases. The incidence of lymph node metastasis in stage I cases was 18 per cent; in stage II cases, 40 per cent, and in the entire group of 344, 26 per cent. Of the 344 patients, 85 received preoperative irradiation. In these the incidence of lymph node metastasis was 28 per cent (nodal metastasis).

One hundred and ninety-three patients with carcinoma of the cervix were operated upon and followed up for 5 or more years. One hundred and thirty-nine were in stage I, 53 in stage II, and 1 was in stage III. The 5 year salvage rate in stage I cases was 75 per cent, and that in stage II cases was 54 per cent. Among the 193 patients, 49 had lymph node metastasis. Radical hysterectomy with pelvic lymphadenectomy salvaged 17 of these (35%). One hundred and forty-four had no lymph node metastasis and 116 of these (81%) have been salvaged. —*John R. Wolff, M.D.*

Sarcoma of the Uterus (Il sarcoma dell'utero). UMBERTO BOLOGNA. *Clin. ostet. gin.*, 1954, 46: 189.

Ten instances of uterine sarcoma were admitted to the Obstetrico-Gynecological clinic of the University of Rome in the period from 1946 to 1952. This number comprised part of a total gynecological material of 19,102 patients, that is, 0.052 per cent, and 1.13 per cent of all malignant tumors of the uterus.

The first patient was a 44 year old unmarried woman, complaining of loss of weight, weakness, leucorrhea, and lumbopelvic pains. During the past 3 months she had noted atypical bleeding from the vagina. The portio was transformed into a bleeding, necrotic, vegetating mass. Both broad ligaments were infiltrated. Biopsy disclosed the presence of a sarcoma fusocellulare. Despite intensive radium and roentgen therapy the patient died 4 months later.

The second patient was a 38 year old para 2, whose mother had died of carcinoma of the bladder, and who for 2 months had noted profuse loss of blood from the genitalia and abdominal pains. The uterus was the size of a 2 month pregnancy. Biopsy disclosed the presence of a polymorphous-celled sarcoma. Since the condition seemed not to have extended beyond the uterus itself, a bilateral adnexectomy and total hysterectomy were carried out and followed by 2 courses of roentgen therapy. Seven years later no evidence of recurrence or metastasis could be found.

The third patient was a 63 year old para 2, who had been suffering for about 4 months from pain in the lower abdomen and who had noted a blackish, fetid discharge from the vagina. The patient brought with her to the clinic a fibrous-hard, rounded mass, the size of a fetal head, which she claimed to have expelled on the preceding day. Biopsy of the mass showed a fusocellular sarcoma. Despite two courses of radium and roentgen therapy the patient died a few months later.

The fourth patient was a 43 year old para 3, who had noted for the past 5 months, a sanguinous discharge from the genitalia, mild lumbopelvic pains, rectal tenesmus, dysuria, and frequent attacks of subfebrile temperature. The cervix was hypertrophic and of fibrous consistency. A subtotal hysterectomy for fibroids had been carried out in another institution a month previously. Biopsy of the cervical stump disclosed the presence of round-celled sarcoma. Despite a course of radium and roentgen therapy the patient died 5 months after leaving the hospital.

The fifth patient was a para 7, 47 years of age, who complained of frequent and painful menorrhagia for the past 5 months. The cervix was reddened, hypertrophic, and shortened. The uterine corpus was enlarged to the size of a pregnancy of 2 months; it was fibrous, of irregular surface, antiflexed, pushed to the right, and rather immobile. Biopsy disclosed the presence of a fusocellular sarcoma. Despite the poor general condition of the patient, she was subjected to bilateral adnexectomy and total hysterectomy, and subsequently to two courses of roentgen therapy. This patient was in excellent condition when leaving the hospital and was still living 5 years later.

The sixth patient was a 58 year old para 4, who for the past year had noted a blackish, malodorous discharge from the vagina, profuse menometrorrhagia, and an increase in the size of the abdomen. For the past 2 weeks there had been attacks of subfebrile temperature. A necrotic, bleeding, egg-sized fibrous mass protruded from the cervical canal. The body of the uterus was the size of a 4 month pregnancy and was relatively immobile; the parametrium was infiltrated. Biopsy disclosed the presence of a small round-celled sarcoma. In view of the poor general condition of the patient only medical measures were undertaken. The patient died about 2 years later.

The seventh patient was a 76 year old single woman who for 2 months had been losing blood from the genitalia. There was a moderate increase in the volume of the abdomen and some loss of weight. A polyp of the cervical canal had been removed 34 years previously and 1 year previously the right breast had been removed for cancer. Biopsy disclosed the presence of a polymorphous-celled sarcoma. The uterus was moderately enlarged and relatively immobile; the parametria were infiltrated. Only medical measures were attempted. The patient died about 2 years after leaving the hospital.

The eighth patient was a 36 year old para 2, who had suffered when 25 years of age from bilateral adnexitis and when 26 years of age, from exudative pleuritis. Her mother had died at 33 years of age of pulmonary tuberculosis. For the past 5 months the patient had noted blood loss of fetid character from the genitalia, lumbopelvic pains, and an increase in size of the abdomen. The cervix appeared to be normal; the corpus uteri was only slightly enlarged, fibrous, anteflexed, and mobile. A cystic orange-sized mass was present on the left side. Curettement showed only endometrium in the proliferative phase. A subtotal hysterectomy with removal of the cyst was performed. Histologic examination of the fragments of the removed uterus disclosed the presence of a carcinosarcoma. Treatment was limited to 2 courses of roentgen therapy. The patient died 18 months after cessation of the treatment.

The ninth patient was a 64 year old primipara, who had been suffering for 2 months from profuse bleeding from the genitalia, loss of weight, increase in the size of the abdomen, and frequent, painful urination. The cervix was hypertrophic; the corpus was increased in size to that of a 4 month pregnancy, and was firm, nodular and quite mobile. A subtotal hysterectomy for fibroid was carried out. Curettement had disclosed only an endometrium in the secretive phase, but histologic examination of the removed uterus disclosed a fusocellular sarcoma. Two courses of radium and roentgen therapy were administered and 3 years later the patient was still living and in good health.

The tenth patient was a 54 year old nullipara, who had been suffering for 4 months from blood loss from the vagina, despite the fact that she had undergone a subtotal hysterectomy for fibroids 2 years previously. She complained of loss of weight, abdominal pains, attacks of subfebrile temperature, and an increase in size of the abdomen. There was rectal tenesmus and frequent, urgent urination. The patient was a diabetic. The vagina was infiltrated in its upper third, deeply ulcerated, and bled easily. The pelvis was diffusely infiltrated. Biopsy of the cervix disclosed the presence of a fusocellular sarcoma. Despite two courses of roentgen therapy the patient died after a period of 14 months.

The author emphasizes the need of earlier diagnosis and of a careful biopsy study of every patient before carrying out subtotal hysterectomy for fibroids; and he believes that radical surgery should be done, when possible, followed by radiation therapy.

—*John W. Brennan, M.D.*

ADNEXAL AND PERIUTERINE CONDITIONS

Primary Cancer of the Uterine Tube. ULLA VATAJA. *Acta obst. gyn. scand.*, 1954, 33: 465.

THE LITERATURE on carcinoma of the fallopian tube is reviewed, and a case is reported.

At the Women's Clinic of the University of Turku in Finland, in the 10 year period from 1944 to 1953, cancer of the fallopian tubes occurred in 0.01 per cent of all gynecologic cases, and in 0.03 per cent of all gynecologic laparotomies. The disease usually occurred between the ages of 40 and 60 years. It was unilateral in two-thirds of the cases. The central or distal portion of the tube was usually involved and this resulted in occlusion of the tube with the outward appearance of a hydrosalpinx. The mass varied in consistency from a hard to fluctuating character.

Tubal cancer was difficult to diagnose clinically. Cramplike or lancinating lower abdominal pain was common. A thin, blood-mixed discharge, the color of dirty water, occurred intermittently in about 25 per cent of the patients.

The prognosis was poor unless the disease was diagnosed early. Treatment consisted of total hysterectomy and bilateral salpingo-oophorectomy. Postoperative x-ray therapy was recommended. Metastases occurred by contiguity and by the lymphatic and hematogenous routes. The most frequent sites of involvement were the ovaries, the contralateral tubes, the uterus, the peritoneum, and abdominal organs.

—Alan Rubin, M.D.

Histologic and Functional Study of Ovaries Conserved After Experimental Hysterectomy (Étude histologique et fonctionnelle des ovaires conservés après hystérectomies expérimentales). M. MAYER, H. TUCHMANN-DUPLESSIS, J. QUELET, and A. SAHY. *Gyn. Obst.*, Par., 1954, 53: 596.

THE ROLE of the blood supply in ovarian function following hysterectomy was investigated in the white rat. Thirty-eight animals divided into groups of similar weight, age, and parity were utilized. Two series of experimental animals were submitted to hysterectomy: one with conservation of the uterine artery and one with removal of the uterine artery. An equal number of control animals had exploratory laparotomy only. For 8 months the estrus cycles were followed by vaginal smear. All were sacrificed and the ovaries, pituitary, adrenal, and thyroid glands compared.

The control rats and the animals whose uterine artery had been preserved exhibited no significant difference by gross and microscopic examination. The animals whose uterine artery had been removed had larger ovaries, containing few normal follicles and many large, cystic follicles. Estrus cycles in these animals tended to be irregular. Three rats had irregular estrus prior to operation. The abnormality was greatly exaggerated following surgery.

It was concluded that preservation of an adequate blood supply and the associated nerve supply was vital for the function of the ovary after hysterectomy. It was suggested that patients presenting ovarian malfunction prior to surgery should have oophorectomy with hysterectomy. *—George C. Lewis, Jr., M.D.*

EXTERNAL GENITALIA

Clinical Considerations with Reference to Vaginal Cytodiagnosis by Means of Contrast Phase Microscopy (Considerazioni cliniche sulla citodiagnosi vaginale a mezzo del contrasto di fase). ANGELO DE PALO. *Minerva gin.*, Tor., 1954, 6: 534.

THE PRESENT REPORT is based on the examination of 929 smears in 350 patients. The material consisted of 42 healthy women; 14 women in the first half of pregnancy; 12 in the second half; 22 with inflammatory processes; 49 with so-called precancerous lesions; 150 with cancer; 20 patients who had been subjected to a radical panhysterectomy; and 41 patients who had been treated with radium.

Forty-five appended photographs (taken with a Zeiss-Winkel camera attached to the contrast-phase microscope) show what one may expect from this method. The photographs are apparently the principal justification for making the report at this time, since the author admits that he is not yet ready to evaluate the diagnostic accuracy of the method of contrast-phase microscopy. The photographs, taken with the aid of polarized light and dark field illumination, comprise a remarkably clear and suggestive documentation of the work on this material.

On the whole, the method permits an accurate demonstration of the morphologic and structural characteristics of the cells which is more than sufficient for an exact distinction between the normal and the pathologic elements, and has the added advantages of being available immediately and of being conducted on the fresh tissue elements without the added distortions and cytochemical changes incident to the process of fixing and staining. A further advantage consists in the ability to observe the living cell; however, the processes of vital staining and the subsequent study of the stained specimens show that most of these cells are already dead and frequently rather far advanced in the process of postmortem cytolysis.

The fact that 41 patients had received radium treatment indicates that the method also has prognostic value, and practically the same may be said of its use in the 20 instances in which panhysterectomy had been done.

In conclusion the author expresses the opinion that the method of contrast-phase microscopy is on a par with the stained smear methods, if not superior in its diagnostic and prognostic results.

—John W. Brennan, M.D.

MISCELLANEOUS

The Significance of Histochemical Methods in Gynecologic Histodiagnosis and Cytodiagnosis (Die Bedeutung histochemischer Methoden fuer die gynaekologische Histo-und Zytodiagnostik). PETER STOLL, HANS EBNER, and WERNER LINDENSCHMIDT. *Geburtsh. & Frauenh.*, 1954, 14: 1065.

RECENT ADVANCES in histochemistry have been utilized in the study of basic gynecologic problems. Various substances so studied may be classified as follows:

1. Nucleic acids: desoxyribonucleic acid and ribonucleic acid.

2. Amino acids and proteins: primary amino groups of x-amino acids, peptides and proteins, tyro-

sine, tryptophane, histidine, arginine, cysteine, and cystine.

3. Lipids: neutral fats, phospholipids, acid lipids, cholesterol and its esters, and ketosteroids.

4. Polysaccharides: glycogen, acid mucopolysaccharides, glycolipids.

5. Enzymes: esterases, cholinesterases, phospatases, phosphoamidases, and lipases.

The authors briefly review the contributions of histochemistry in the study of the endometrium, its normal cycling, placentation, endometrial hyperplasia, and carcinoma. They then summarize the known data on histochemical methods used in the study of the effect of ovarian stimulation on the growth, the ripening, and functioning of vaginal and cervical squamous epithelium, and also the findings with carcinoma in situ and the studies on the basement membrane.

—*Warren R. Lang, M.D.*

Treatment of Pelvic Cancer in Philadelphia; Review of 1,234 Cases. JOHN Y. HOWSON. *Obst. Gyn.*, 1954, 4: 591.

THE ADEQUACY OF THERAPY for 1,234 cases of pelvic cancer collected from 32 hospitals by the Philadelphia Committee for the Study of Pelvic Cancer is reviewed in relation to minimum standards for care. Of 65 patients with Stage I cervical carcinoma 35 per cent were found to be inadequately treated. Twenty-three per cent of 126 Stage II patients were inadequately handled. Adequate treatment for cervical cancer was defined as combined radium and x-ray irradiation, radical hysterectomy with bilateral lymphadenectomy, or a combination of radiation and surgery.

Simple total hysterectomy and bilateral salpingo-oophorectomy was used most frequently in the insufficiently treated cases. Radium alone, and x-ray by itself were the next most commonly used.

In the treatment of endometrial carcinoma minimal adequate therapy was defined as total hysterectomy with bilateral salpingo-oophorectomy. Following these criteria 25.9 per cent of 541 cases of endometrial carcinoma were considered incompletely treated. Medically and surgically inoperable patients were not included in the figures. Subtotal hysterectomy was used in 40 per cent and radiation without surgery in 34 per cent of the inadequately treated patients.

Patients with operable cancer were reviewed in the ovarian category. Of 178 patients so classed only 50 per cent were found to be treated by total hysterectomy and bilateral salpingo-oophorectomy. Supravaginal hysterectomy (63%) and unilateral salpingo-oophorectomy (37%) were performed in the remainder of the cases.

The treatment of vulvar cancer was defined as radical vulvectomy and bilateral inguinal lymphadenectomy in the operable patient. Forty-nine per cent of 71 such patients were treated inadequately. Fifty-one per cent had radical vulvectomy alone while the remainder had less extensive vulvar surgery.

Of the entire group of 1,234 patients 25.7 per cent were found to have had less than adequate opportunity for cure because they had inadequate therapy.

—*George C. Lewis, Jr., M.D.*

Results of an Experiment in the Control of Cancer of the Female Pelvic Organs, and Report of a 15 Year Research. CATHARINE MACFARLANE, MARGARET C. STURGIS, and FAITH SKINNER FETTERMAN. *Am. J. Obst.*, 1955, 69: 294.

AS A FOLLOW-UP of a previously described research program, the results are detailed for an investigation of 1,319 women during the period between January 1, 1938 and December 31, 1952. Five hundred and thirty-seven cases were being followed at the end of this time. In performing 18,753 pelvic examinations, 17 pelvic cancers were discovered. Four of these were cervical, 5 corporeal, 6 ovarian, and 2 vaginal.

The examinations also revealed 986 benign lesions, over half of which consisted of inflammatory changes of the cervix, frequently considered premalignant. Many of these were treated. It was believed that this therapy accounted for the low number of cervical cancers observed over a period of 15 years. In the last 10 years 11,203 examinations of the breast were carried out on 537 patients. Eleven cancers were found, and all of them were first detected by the patients, a point considered strongly in favor of self-examination.

—*George C. Lewis, Jr., M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Pelvic Arteriography As a Diagnostic Procedure in Early Intrauterine Pregnancy and Tubal Pregnancy (Beckenarteriographie als diagnostisches Hilfsmittel bei fruehen Intrauteringraividitaeten und Tubenschwangerschaften). U. BORELL, I. FERNSTRÖM, and A. WESTMAN. *Geburtsh & Frauenh.*, 1955, 15: 11.

THE DIFFERENTIAL diagnosis between tubal pregnancy and uterine pregnancy is often difficult to make in the early stages of these conditions. For many years the authors have made use of angiography for diagnostic purposes in the presence of pelvic masses. In the present article they report 15 cases of intrauterine pregnancy (6–11 weeks) and 16 cases of tubal pregnancy (5–14 weeks). The patients were examined by this method because of lower abdominal pain and vaginal bleeding. A catheter was inserted in the femoral artery up to the aortic junction and 40 ml. of a 50 per cent umbradil solution were injected. Pictures were taken at the end of injection and a few seconds later.

Only at the seventh or eighth week of gestation was there a definite shadow projected as a result of the placental sinus. While usually the branches from the adnexal vessels do not show at all on the arteriogram, a filling of the branches of the uterine artery is to be expected in about 50 per cent of nonpregnant women. In extrauterine pregnancy the filling of the uterine artery and the intramural vessels is the same as in a nonpregnant woman; there is, however, a shadow projected laterally which represents a placental sinus fed by the ovarian artery or its branches. The arteriogram makes it possible to differentiate a uterine pregnancy from a tubal pregnancy if the placental sinus is developed well enough and can be localized with regard to the uterine artery and its branches.

It takes 7 weeks for a uterine pregnancy, and 5 weeks for a tubal pregnancy to form a visible placental sinus. The difference in time is due to the temporary masking of the placental sinus by the intramural vessels. The gestational age is calculated from the first day of the last period, which is a difference of 2 weeks from our normal calculation.

A rather dense adnexal circulation may simulate a placental sinus and give a false impression. Arteriograms taken at different stages of the normal menstrual cycle have never given a similar picture. The authors accept the belief that a corpus luteum graviditatis is necessary before the dense circulation can be projected.

In many of the 500 cases, an aortography also was performed, which proved that only rarely is the uterus supplied with blood from the ovarian artery. The uterine tube, or part of it, however, might be supplied from the ovarian artery. If the branches of the uterine artery fail to project a placental sinus, it may be necessary to perform an aortogram in order to fill the ovarian artery. They conclude that pelvic arteriography is a valuable diagnostic procedure for the differential diagnosis between uterine and tubal pregnancies. —*Robert O. Verheecke, M.D.*

LABOR AND ITS COMPLICATIONS

The Clinical Management of Dystocia. PAUL O. KLINGENSMITH. *Surg. Clin. N. America*, 1954, 34: 1579.

DYSTOCIA is a broad term used to denote difficulty arising from the mechanical forces of labor.

The forces of labor fall into two general groups: the active or motivating force, and the passive or resistant force. The primary active force is supplied by the uterus, and a secondary active force by the abdominal muscles. Passive or resistant forces are offered by the parturient canal and fetus. These forces are closely integrated, but labor can best be understood by the analysis of each force. The clinical management of dystocia deals with recognition of the anomalies.

It is known that truly refractory disturbances of uterine motility are seen most often in women in their first labor. They seem especially prone to occur in the abnormally fearful primigravida. The best known prophylactic treatment for poor uterine motility is proper preparation of the patient for labor. The physical aspects of the preparation are much less important than the physiological.

Overdistention of the uterus predisposes to abnormal uterine motility. The cause of the abnormal distention is established by x-ray visualization of the uterine contents. When the distention is due to an excessively large single fetus or mature twins, induction of labor may be considered. However, it has not been proved that an induced labor is of better quality than that to be expected of the spontaneous contractions which would soon be forthcoming. Labor should not be induced unless a vertex is presenting and engaged, and the cervix is partially effaced and dilated at least 2 cm. Overdistention from hydramnios is treated with bed rest, salt restriction, and diuretics. If these measures fail, release of excess fluid is indicated, provided the fetus is mature.

A difficult second stage of labor can often be best resolved by good abdominal force. A well conducted program of physical training of the abdominal muscles and diaphragm may prevent dystocia in midpelvis.

The vagaries of uterine action call for accurate diagnosis rather than hasty action. It should be recalled that the uterus contracts throughout pregnancy, and the transition into true labor may be difficult to discern. Cesarean sections have been done on patients in false labor. Regardless of the apparent force of the uterine contractions, when there is no effacement or dilatation of the cervix, the problem is one of false labor. Once progress is arrested after change in the cervix occurs, the diagnosis of abnormal uterine action should be entertained. However, lack of progress is only presumptive evidence of inefficient uterine force and should not be used as a basis for active treatment.

Hypotonic uterine action is the most frequent anomaly of the primary active force. It has fittingly been called "slow labor." Only the threat of exhaustion, infection, or fetal distress will force the hand in the conservative treatment of dystocia.

Exhaustion may be averted by moral support, rest, fluid, and calories.

In labor prolonged by hypotonic uterine action, infection is the principal hazard to mother and infant. The potential of infection exists in all patients with ruptured membranes, and it may occur without obvious evidence of amniotic fluid leak. When labor does not become actively progressive within 4 hours of membrane rupture, or is prolonged beyond 12 hours with apparently intact membranes, antibiotics are indicated. The intramuscular injection of a combination of aqueous penicillin (100,000 units) and procaine penicillin (300,000 units) every 12 hours is good prophylactic treatment. If penicillin sensitivity or infection from penicillin-resistant organisms is suspected, intravenous terramycin, 250 mgm. may be given intravenously every 8 hours. The dosage is increased when signs of infection are present.

More active treatment of hypotonic uterine action should be considered when there is no response to a good basic regimen after 6 to 12 hours. Artificial puncture of the membranes is indicated, provided the vertex is engaged and the cervix is soft, one-third dilated, and half effaced. Lack of progress in labor after the membranes have been ruptured 3 to 4 hours raises a consideration of direct uterine stimulation.

Various methods have been proposed to stimulate uterine action, but none has a consistent effect except the oxytocic fraction of posterior pituitary extract. However, the powerful action of this agent has great potential for harm, and it should never be used for expediency alone. The crux of the matter is whether the risk of infection, exhaustion, or a traumatic delivery is greater than the risk of the use of pituitrin. When there is doubt, it should not be used. Even when the indication seems clear, the contraindications should be reviewed carefully. A working list of regulations should include the following:

1. True labor, not progressive
2. Normal forces of resistance
   a. Adequate pelvis confirmed by roentgenogram
   b. Flexed vertex presentation
   c. Cervix free of scar
3. Normal uterine muscle
   a. Absence of previous operative incisions
   b. Absence of uterine tumors
   c. Parity not in excess of IV
   d. Age under 35 years
4. Condition of fetus good (or dead)
   a. Regular fetal heart sounds
   b. No meconium-stained liquor amnii
5. Constant attendance by an experienced observer
6. A rested patient

Hypertonic uterine motility is not frequent, but it sorely tests the resources of the patient and physician. Pain is severe even in the early course of labor.

When hypertonicity persists after several doses of a narcotic, regional anesthesia should be considered. Normal patterns of contraindications may develop after local nervous system suppression from caudal or spinal anesthesia. Caudal block is preferred because of better control and longer action. Artificial rupture of the membranes rarely improves hypertonic uterine action. The chance of beneficial effect must be weighed against the disadvantage of potential infection. It is worth trying if other measures have failed and the cervix is dilated at least 4 cm.

Reynolds has shown that occasionally pitocin may change incoordinate action to a normal pattern. However, tetany with fetal distress is a real threat in pitocin stimulation of the hypertonic uterus. The drug is warranted only as a last resort, under expert supervision. Only solutions such as 0.2 to 0.4 c.c. per 1,000 c.c. of 5 per cent glucose in water should be used.

In the presence of fetal distress, maternal exhaustion, or infection, the condition of the cervix determines the mode of delivery. Cesarean section is indicated unless the cervix is near full dilatation. Manual dilatation of the cervix should not be attempted, but cervical incisions with forceps extraction may be successful if the vertex is well below the spines and the cervix near full dilatation and effacement.

Bony pelvic contraction is the second most common cause of dystocia. No patient should be permitted to go into labor without certain knowledge of the pelvic capacity. Certain principles warrant emphasis.

1. Detection is the essence of management.
2. Manual methods of examination cannot be depended upon for accurate diagnosis.
3. X-ray pelvimetry is indicated for all patients with suspected cephalopelvic disproportion.
4. Pelvic capacity influences but does not determine the outcome of labor.
5. A trial of labor is essential to management.

Apparent dystocia from contraction of the pelvic inlet should be tested by labor.

The trial may fail for any of the following reasons: (1) lack of engagement of the vertex, (2) fetal distress, (3) maternal exhaustion, (4) real or threatened intrauterine infection, and (5) threatened uterine rupture.

Cesarean section is indicated for maternal hazard or fetal distress, whether or not the failure of engagement has been tested fully.

The force of the abdominal muscles is enhanced by coaching the patient. As long as the forces remain active and no maternal or fetal hazard is apparent, time should not limit the trial. Intervention is not needed until forces begin to fail or hazard is recognized. Midforceps assistance is indicated when the cervix is out of the way and the vertex truly engaged in midpelvis. If these two conditions are not present, cesarean section should be carried out directly.

The fetus offers resistance in proportion to its size and position. The fetal causes of dystocia are (1) excessive size, (2) malformation, (3) transverse lie (often called transverse presentation), (4) deflexion attitudes of the vertex, and (5) breech.

Potential fetal dystocia should be detected in advance of labor. When the abdomen is excessively large, or a well flexed vertex presentation is not clearly palpable, x-ray visualization of the fetus and maternal pelvis is required. Active treatment may be indicated in advance of labor.

The prophylactic management of abnormal force of resistance due to the parturient canal or fetus is based on recognition of disproportion in advance of labor. However, a trial of labor is needed in most cases to determine the outcome. —*Harry Fields, M.D.*

Active Versus Conservative Technique in Breech Delivery and the Prophylactic Value of External Version in Pregnancy. POUL KÜHNEL. *Acta obst. gyn. scand.*, 1954, 33: 360.

PROPHYLACTIC EXTERNAL VERSION can be carried out right up to term; even in the last 3 weeks of pregnancy there is still a 50 per cent chance of success, particularly in multiparas, although the optimum time is the thirty-fourth week of pregnancy.

External version was successful in 75 per cent of 254 cases in the present series. The view is expressed that failure of version in primiparas is probably due to the fact that the procedure is attempted too late in pregnancy. It is emphasized that external version should be carried out carefully and gently, and without anesthesia. If the first attempt is unsuccessful, external version can and should be repeated. It should always be preceded by roentgenography with special reference to the presence of extended legs. Failure of version is often due to this factor. Fetal mortality in vertex presentation brought about by external version in primiparas is no higher than in cases of normal vertex presentation. In the cases presented it was 0.5 per cent.

Cases in which external version was successful did not require more active assistance during labor than did cases of normal vertex presentation.

Fetal mortality rates for infants of over 2,000 gm. birth weight are contrasted for various methods of management of breech delivery. The "corrected" (excludes causes of death not related to delivery) fetal mortality rate for 126 cases treated conservatively, i.e., permitting birth of the infant to the umbilicus, was 1.6 per cent. In 136 cases treated actively, i.e., by extraction of the infant as soon as there was ample dilatation of the soft parts, the "corrected" fetal mortality rate was 11.6 per cent.

It is concluded that strictly conservative management of breech deliveries is the best technique if vaginal delivery is contemplated.

—*Alan Rubin, M.D.*

The Problem of Cesarean Section After Special Consideration of Newer Indications (Zum Problem der Sectio caesarea unter besonderer Beruecksichtigung der erweiterten Indikation). J. REITINGER. *Wien. med. Wschr.*, 1955, 105: 57.

MORE THAN 10 YEARS have elapsed since Tasch reported, in 1942, the incidence of cesarean section in the Second Woman's Hospital of the University of Vienna. From 1942 until 1952 there were 24,970 deliveries, of which 261 resulted in cesarean section, an incidence of 1.04 per cent. For the years 1909 to 1928, the comparative figures were 1.18 per cent, and for 1929 to 1941 they were 0.93 per cent. The author notes that this incidence is still lower than in most German hospitals and has not changed essentially since new indications have been added.

The most frequent indication is cephalopelvic disproportion (56.32%). The author considers the conjugata vera very important. A flat pelvis with a conjugata vera of less than 8 cm. and a generally contracted pelvis with a conjugata vera under 8.5 cm. will end in a spontaneous birth in only 70 per cent of the cases. A general rule as to when a cesarean section will have to be done does not exist as more factors than cephalopelvic disproportion play a role. Contracted pelves, grades 1 and 2, are sectioned only after the membranes have ruptured and consequently no progress is obtained within a few hours. Although the author uses x-ray pelvimetry he is aware of the report by Kirchoff and Moebius regarding fetal damage resulting from irradiation.

The second most frequent indication is placenta previa (14.17%). The incidence is approximately the same as in previous reports. Since there is an increased incidence of infection the author prefers to use the vaginal route. Only in the presence of a central placenta previa, a viable infant, and extensive bleeding is a cesarean section performed. Added to the maternal indication the fetal indication is now more and more important.

In 18 cases cesarean section was performed because of eclampsia or pre-eclampsia (6.89%). It is generally accepted that both of these conditions play an important role in the increasing mortality rate of the mother and infant, the latter very often being prematurely delivered. Only when conservative treatment is unsuccessful is a cesarean section performed.

Three among 18 patients died postoperatively: 1 from coma hepaticum after 13 hours, 1 from pneumonia on the eleventh day, and 1 from verrucous endocarditis with death on the twelfth day.

The last group, named "varia," included 22.60 per cent of the cases, while in the previous study it only amounted to 11.9 per cent. The group comprises old primiparas with prolonged labor or soft tissue resistance, also abnormal presentations, and erythroblastosis. After careful evaluation it was thought that these borderline cases were best managed by section; however, having lost 2 erythroblastotic infants because of prematurity the author decided to let them go to term from then on.

Recent progress in medicine has stimulated obstetricians to reconsider the morbidity of cesarean section. The antibiotics and improved surgical and anesthetic techniques are the main factors responsible for this change. The author's incidence of morbidity of 1.8 per cent is still lower than that of many American and German workers, who report morbidities between 3 and 6 per cent. He considers that cesarean section is still endangering to life, even in the best surgical hands. The most frequently used technique is the transperitoneal lower segment incision. In 6 cases a classical cesarean section was performed for the following reasons: the presence of carcinoma of the cervix (1), fibromatous uteri (3), extensive adhesions (1), and plastic repair of a vesicovaginal fistula (1). The advantages mentioned are less excessive bleeding and an easier delivery of the fetal head. The extraperitoneal technique previously used in patients with infection seems to have lost its place now that so many types of antibiotics are available.

The anesthetic of choice is a combination of nitrous oxide and curare given by trained anesthesiologists. Ether anesthesia, used in previous years, is believed to cause far too many asphyctic infants. A too high spinal anesthetic may be dangerous to the patient who, under that type of anesthesia, seems more inclined to have a circulatory collapse. Peridural anesthesia is helpful in

eclampsia. There were 8 maternal deaths. Three occurred in eclamptic patients and 1 in a patient with cervical carcinoma; the 4 remaining patients had true surgical deaths: 1 due to peritonitis, 2 to atonic bleeding, and 1 to anesthesia.

Two-hundred-sixty-two infants were born alive and 11 died (4.21%). Very often a cesarean section is performed mainly because the mother is in danger and often the infant is also in a critical condition; this naturally increases the fetal mortality. Some authors believe that a cesarean section should be done only when the viability of the fetus is not in doubt.

The infant mortality is broken down as follows: 4 4 intrauterine deaths, 3 central placenta previas, 1 abruptio placentae, 2 erythroblastotic infants, 3 instances of intrauterine asphyxia, and 1 instance of fetal damage (tentorium tear).

The morbidity, mainly due to endometritis, has been greatly reduced since the use of penicillin. Improved anesthetic techniques have eliminated many pulmonary complications. Since the use of penicillin, the waiting period after rupture of the membranes does not seem to influence the morbidity. No change, however, was noticed in postsurgical urinary infections, thrombophlebitis, mastitis, and wound infections.

Repeat cesarean sections were mainly done for cephalopelvic disproportion.

The present report shows, first, a definite decrease in fetal and maternal mortality due to the use of antibiotics, better anesthetic techniques, and incision of the transverse lower segment. A slight increase in cesarean sections is noticed which is due mainly to the fact that the infant is being considered in more cases; however it is not believed that an excessively higher incidence is to be expected. —*Robert O. Verheecke, M.D.*

Anesthesia in Modern Obstetrics. W. ROBERT PENMAN. *Surg. Clin. N. America*, 1954, 34: 1551.

BECAUSE OF THE UNPREDICTABLENESS of the onset of labor, patients frequently enter the hospital in early labor after recently ingesting a full meal. They are obviously not ideal candidates for analgesia or anesthesia.

A review of the anesthetic deaths reported to the Maternal Mortality Committee of the City of Philadelphia during the past 5 years revealed that the incidence of anesthetic deaths has varied between 11 and 12 per cent of all deaths reported to that committee.

During this 5 year period anesthesia consistently ranked second or third as the main cause of maternal deaths, with hemorrhage and/or infection as the leading cause.

Instructions for preparing the patient for the safe use of analgesics and anesthetics should begin early in the prenatal period. Any gross physical defects discerned during the history and physical examination should be corrected. If anemia is found, it too should be eliminated.

The patient should be instructed to refrain from eating any solid foods or take liquids hard to digest once she notes the onset of uterine contractions, even if irregular at first. Once labor ensues, gastrointestinal physiology is altered and the emptying time of the stomach is prolonged even more than during pregnancy. Therefore, if a large meal is eaten early in labor, it may form the nucleus for a fatal aspiration of vomitus during the administration of anesthesia.

After the patient has received an analgesic, consideration should be given to the problem of anesthesia for delivery. It is at this time that the anesthetist should be consulted.

The patient's general condition should be assessed. The type of delivery and the degree of difficulty anticipated should also be discussed. With this approach the anesthetist can safely anesthetize the patient and enable the obstetrician to complete the delivery under conditions optimal to himself, the patient, and the newborn baby.

Anesthesia is of sufficient importance in obstetrics to warrant individual patient evaluation and discussion well in advance of delivery. Anesthesia should not be routinized, but individualized with each patient receiving the anesthetic which best suits her and the newborn's needs.

In the management of breech delivery, the patient should be carried with analgesia and light nitrous oxide and oxygen anesthesia until the breech presents. The patient is allowed to deliver the breech spontaneously to the level of the umbilicus. At this time the anesthetist should be advised according to a prearranged anesthesia delivery plan to deepen the anesthesia, using ether if necessary in order to facilitate the safe delivery of the shoulders and the aftercoming head. The deepened anesthesia for the delivery of the shoulders and the head is important as the obstetrician cannot predict in advance the degree of difficulty which will be encountered. If difficulty is encountered, the complete uterine relaxation permits the obstetrician to complete the delivery more efficiently and safely.

Spinal or caudal anesthesia should never be used for the delivery of a breech. Under both these anesthetics the uterus maintains its tonus and contraction pattern. If shoulder or after-coming head dystocia is encountered, the uterine tonus makes delivery of these parts more difficult, and in turn will increase the fetal mortality.

When a decomposition and extraction of a frank breech is indicated, the problem of anesthesia should be discussed well in advance with the anesthetist. In this instance, the obstetrician needs complete uterine relaxation, which can be achieved only with deep ether anesthesia, the anesthetist carrying the patient to the level of the third plane of the third stage of anesthesia. With this type of anesthesia, the obstetrician can perform the intrauterine manipulations with relative ease and without fear of rupture of the uterus.

In the management of premature labor and delivery several points are stressed. Once the woman has gone into premature labor, no analgesic should be used. Lumbar paravertebral block anesthesia is recommended for pain relief in these cases, saddle block anesthesia toward the latter part of labor, and caudal anesthesia.

In the management of the toxemic patient, the problems are medical as well as anesthetic.

Because of late vasomotor instability, paravertebral block and analgesia are contraindicated in these patients. The safest type of anesthesia is local infiltration or pudendal block anesthesia.

If an inhalation anesthetic is indicated, ether is the agent of choice. The toxemic patient tolerates ether better than any of the volatile agents.

In the management of the bleeding patient, three objectives must be realized: (1) cessation of bleeding, (2) replacement of blood loss, and (3) safe delivery. If the fetus is viable, analgesics such as morphine and demerol should be withheld, because fetal oxygenation may already be in a precarious state because of the blood loss. For delivery, local block or pudendal block is undoubtedly safe. If an inhalation agent is indicated, ether or cyclopropane anesthesia, along with adequate blood replacement, constitutes the safest therapy.

Spinal anesthesia is contraindicated in the presence of hemorrhage because it may produce shock.

Anesthesia is always a major problem with cesarean section, and many factors must be considered before any one agent or method is advised. Single dose spinal or fractional spinal anesthesia is excellent. Occasionally fractional or continuous spinal technique is used; however, these methods are not used in patients with severe benign hypertension or severe pre-eclampsia or eclampsia, because of the inconstant results obtained therapeutically and because of the extreme vasomotor lability seen in these patients. It is believed that spinal anesthesia is also contraindicated in cases of bleeding placenta previa and abruptio placentae, in which bleeding or shock may be present as part of the clinical picture. This type of anesthesia is also not used with dermatologic lesions involving the posterior thoracolumbar area.

Cyclopropane or ether is best when an inhalation anesthetic is deemed advisable. Patients are not routinely premedicated prior to cesarean section.

—*Harry Fields, M.D.*

Obstetric Anesthesia; Shane-Ashman Method in 1131 Deliveries. Leon Greenwald, Fred Edmunds, Theresa Haubrick, James Gray, and Others. *Obst. Gyn.*, 1955, 5: 63.

The Shane-Ashman anesthesia method was used in delivering 1,131 mothers. The breathing and crying times were recorded and compared with those of 904 infants born of mothers under terminal saddle block spinal analgesia. The mothers in both groups received approximately the identical sedation in the form of demerol, scopolamine, and a barbiturate such as seconal or nembutal, one half the anesthetic dose of both nitrous oxide (45 per cent) and cyclopropane (10 per cent) administered with 45 per cent oxygen in a semiclosed absorption system in conjunction with the amnesic sedation; or in lieu of this sedation, an amnesic (not anesthetic), intravenous dose of a barbiturate or demerol, was given. This method of anesthesia was used in 1,131 deliveries and its results were compared with the results of 904 deliveries under spinal saddle block.

It is the studied and carefully evaluated opinion of the authors that the Shane-Ashman anesthesia method is the safest, least depressing general method available for obstetric use when the anesthesias are administered by house officers untrained in anesthesia.

The technique for administering this anesthesia is presented in detail, and the following results are recorded:

The Shane-Ashman method does not depress the fetus unduly.

It does not promote vomiting despite the presence of a recently ingested meal. This fact is of paramount importance since the aspiration of vomitus in the parturient under general anesthesia is the most frequent single cause of maternal mortality.

There was no maternal death in this series.

There were 39 fetal deaths in a total of 2,035 cases, none of which were attributable to either the saddle block or the Shane-Ashman method of anesthesia.

When the Shane-Ashman anesthesia method was used postpartum hemorrhage was not more frequent than when other types of general anesthesia were used.

—*John R. Wolff, M.D.*

NEWBORN

The Role of an Infant Resuscitation Team in Investigative Studies of Respiratory Onset at Birth. Roy F. Goddard. *Current Res. Anesth.*, 1955, 34: 1.

In spite of a decrease in the over-all infant mortality of approximately two-thirds, the past 40 years has brought no significant reduction in infant deaths in the first 24 hour period.

The leading causes of death in this neonatal period have changed, however, and today anoxia and abnormal pulmonary pathology constitute 59 per cent of the causes of death in this early period. These are conditions which may be responsive to resuscitation, and with which anesthesiologists, obstetricians, and pediatricians as a resuscitation team should be vitally concerned.

As a result of laboratory investigations a resuscitative device was developed (the Goddard-Bennett-Lovelace infant hand resuscitator) which (1) could deliver pressures necessary to expand the unexpanded lung of the newborn, (2) would safely control the time period over which a pressure impulse was given, (3) controlled the volume of gas introduced with each impulse, (4) allowed for compliance factors of the lungs and chest wall, and (5) gave an impulse pattern closely simulating the respiratory pattern of the normal infant.

Such a device would meet the needs of the various categories of infants requiring resuscitation. Clinical application was the next step in the program; actually clinical studies have been proceeding simultaneously with the laboratory investigations, and it was from both types of studies that the safety features and mechanical improvements of the device evolved.

The principles of resuscitation are as follows:

1. Establish a patent airway
2. Promote adequate drainage of the upper respiratory tract with:
   (a) Postural drainage
   (b) Gentle nasal and postpharyngeal suction
3. Expand the lungs by intermittent positive pressure
4. Administer oxygen
5. Maintain temperature and humidity
6. Perform gastric lavage when indicated
7. Give stimulants when indicated:
   (a) Chemical (nalline, caffeine sodium benzoate)
   (b) Cutaneous or proprioceptive

The first two principles are carried out immediately, the next within 2 minutes of birth, and the last 3 are relegated to later measures.

Following resuscitation it is important to continue observation and care of the infant. Such postresuscitative measures are as follows:

1. Continue principles of resuscitation as indicated (postural drainage, intermittent positive pressure, oxygen, temperature, stimulants)
2. Induce high humidity through water fog or mist incorporating detergents and aerosols
3. Avoid regurgitation and aspiration:
   (a) Nothing by mouth
   (b) Hydration through hypodermoclysis and aerosols
4. Prevent infection (intramuscular and aerosol medications)
5. Prevent hemorrhage with intramuscular administration of Vitamin K
6. Conserve infant's energy by a minimum of handling
7. Gradually adjust infant to normal routine

From the studies conducted at the Lovelace Foundation, the following conclusions are offered:

1. Beginning patchy aeration of the unexpanded (atelectatic) lung of the newborn is achieved with a positive pressure of 30 cm. of water; uniform expansion is achieved at pressures of 50 to 60 cm. in the closed chest. Expansion and collapse is adequately achieved without the application of any negative pressure. Following initial expansion, pressures must be reduced accordingly, to prevent damage to the lungs.

2. A safe time interval to apply the high pressures required for expansion of the unexpanded lung of the newborn appears to be 0.2 to 0.3 of a second.

3. The tidal volume of premature infants is considerably less than that of full term infants. Studies show that two to three times the tidal volume may be introduced into the infant lung under pressure without damaging the lungs.

4. The resuscitator described, which was developed to answer the problems of pressure, time, volume, simplicity, and availability, has proved to be an effective laboratory and clinical device.

5. Sixty-nine of 84 babies which were resuscitated with the device survived (82%). With correction for extrapulmonary deaths, the survival rate rose to 93 per cent.

—Harry Fields, M.D.

Atelectasis Neonatorum. IAN DONALD. *J. Obst. Gyn. Brit. Empire*, 1954, 61: 725.

DEATHS from atelectasis in the newborn infant represent an all too frequent source of infant loss. This is true especially of the premature child. Although progress in some phases of prevention of prematurity has occurred, much more is needed.

At present neonatal respiratory difficulties are a major problem. A series of 57 infant deaths are reported, 26 of which were due to atelectasis and hyaline membranes. The theories of the etiology and treatment of hyaline membranes are summarized. The most likely cause is considered to be pulmonary stasis and improper clearance of the respiratory tract. The first few breaths are critical and if the newborn is to have a smooth course the breaths must be vigorous.

Roentgenograms can be of great value in following up the infant who seems to progress poorly. Hyaline membranes can be diagnosed and their progress can be followed roentgenographically. Three phases can be distinguished: (1) fine miliary mottling; (2) coalescent areas of atelectasis, and (3) massive nonaeration of an entire lobe or lung. The first two stages appear reversible and adequate therapy may prove valuable.

Other means may be used to follow up pulmonary alterations. Intrathoracic pressure measurement via the esophagus can be done. The use of the Muller-Shillingford photoelectric pressure transducer is described. Healthy infants can develop more than 60 cm. of water as negative pressure. The measurement of the effort expended is not useful alone. To this must be added the evaluation of tidal air. This can be done with a photoelectric spirometer. When this device is employed with a Drinker, or positive pressure type of resuscitator (Servo resuscitator), the respiratory activities of the child synchronize the operation of the resuscitator with the irregular breathing. The ratio of tidal air to the intrathoracic pressure is used to judge the amount of pulmonary expansion.

The results of the use of the Servo resuscitator in 49 cases are reported. These are compared with the results in 68 untreated infants who could not be considered controls since many required no resuscitation. Twenty-three of the treated infants survived. Sixteen of the deaths in this group could be attributed to atelectasis and 9 to atelectasis and hyaline membranes. Fifty-two untreated infants survived. The deaths in this group included 10 from atelectasis. Six of them were associated with hyaline membranes. Early treatment appeared invaluable. Roentgenograms and studies of pulmonary function helped to establish the type and degree of atelectasis present.

—George C. Lewis, Jr., M.D.

MISCELLANEOUS

Maternal Mortality in the Pennsylvania Hospital (Philadelphia Lying-In Hospital); Tabular Review of Maternal Deaths, 1929–1953. ROBERT MCNAIR MITCHELL. *Obst. Gyn.*, 1955, 5: 123.

THE AUTHOR reviews the maternal mortality in the Pennsylvania Hospital from July 1, 1929 to December 31, 1953. This 24.5 year period has been subdivided into three periods. Comparisons are made between the second period and the first, the third and the second, and between the last 16 years and the initial period.

During the first 8.5 years there were 100 maternal deaths, or 1 death in every 179 live births. In the second 8 year period, the maternal mortality decreased by 67 per cent to 1 death in every 549 live births. There was a further decrease of 60 per cent in obstetric mortality in these last 8 years to 1 in every 1,374 live births. The decrease in mother loss at the Pennsylvania Hospital over the last 16 years was 77 per cent.

Over the 24.5 years, a fetal death occurred for every 45 deliveries, a total antepartum and intrapartum fetal loss of 1,351 infants. There were 527 fetal

deaths (1 for every 36 deliveries) in the first 8.5 years, 400 (1 for every 45 deliveries) in the second 8 years, and 424 (1 for every 55 deliveries) in the last 8 years. Combining the last two 8 year periods, it is noted that 824 fetal deaths occurred (1 for every 51 deliveries). There was a 32 per cent decrease in the fetal death rate during this period.

The high rate of preventability compared to non-preventability suggests the need for re-evaluation of present obstetric measures and activation of methods for increasing precaution in obstetric management through (1) intelligent prenatal supervision; (2) better intrapartum guidance by (a) timely consultation, (b) free use of supportive measures, (c) conservative use of complicated obstetric maneuvers, (d) improved obstetric anesthesia, (e) closer co-operation between the patient, resident physicians, and hospital staff; and (3) intensified postpartum watchfulness.

Infection, hemorrhage, toxemia, and heart disease were responsible for 118 deaths, or 79 per cent of the maternal fatalities during these 24.5 years.

In the last 8 years, infection and hemorrhage were eliminated as offenders. Heart disease, toxemia, anesthesia, embolism, and miscellaneous complications became the main causes of death, and were of almost equal etiologic significance. They accounted for the 17 maternal losses during the last 8 years; heart disease, toxemia, and anesthesia accounted for 10 (59%).

During the last 16 years, 40 (80%) of the maternal deaths were due to heart disease, hemorrhage, toxemia, embolism, and anesthesia.

No deaths primarily from hemorrhage occurred in the past 8 years. The 16 year decrease in maternal mortality from hemorrhage was 83 per cent.

Factors in this drop were (1) elimination of rupture of the uterus from internal podalic version and extraction; (2) improvement in management of abruptio placentae and placenta previa; (3) decrease in the number of traumatic vaginal deliveries through substitution of cesarean section; (4) prompt blood replacement in postpartum hemorrhage; and (5) use of regional anesthesia, by which the myometrial tonicity was maintained.

During the 24.5 years, 3,841 cesarean sections, an operative incidence of 6.3 per cent, were performed at the Pennsylvania Hospital. The incidence of cesarean section increased 20 per cent during the second 8 year period. During the third 8 year period the incidence of cesarean section increased 6.2 per cent. In the last 16 years with the initial 8.5 years, a 24 per cent increase in the use of cesarean section was noted.

The cesarean operative mortality rate was 0.86 per cent. There were 33 deaths following cesarean section during the 24.5 year span. Twenty-four deaths occurred in the first 8.5 year period, 6 in the second 8 years, and 3 in the last 8 years.

The maternal mortality following cesarean section during the last 8 years has been the result of (1) miscellaneous causes such as monocytic leucemia and glioblastoma of the brain, and (2) anesthesia.

Anesthesia was responsible for the last 2 preventable maternal losses.

Maternal deaths from anesthesia at the Pennsylvania Hospital were the result of (1) overdosage in single spinal injections, (2) aspiration of vomitus, (3) inadequate immediate follow-up of the anesthetized patient, and (4) neglect in evaluation of the patients prior to anesthesia. —*Harry Fields, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Tumors of the Suprarenal Gland. Tumors of the Suprarenal Medulla (Tumori delle ghiandole surrenali. Tumori della midollare surrenale). CESARE CAVALLERO. *Boll. oncol.*, Rome, 1954, 28: 455.

PRIMARY TUMORS of the suprarenal medulla are of two general types: those belonging to the so-called sympathetic series and those belonging to the chromaffin series. Each series includes the neoplasms showing the histologic, pharmacologic, and oncologic characteristics of the sympathetic ganglion cell or of the chromaffin cell of the suprarenal medulla. Each series presents an unbroken line of differentiation, from the earliest cells of the fetal anlage to the fully differentiated adult cell. Thus, for the sympathetic series we have the earliest undifferentiated sympathogonioma, arising from the primordial fetal neuroectoderm, and its more nearly maturated derivative, the sympathicoblastoma with its tendency to the formation of rosettes and rare neurofibrils arranged in fascicles. Still more nearly matured are the cells of the ganglioneuroblastoma and, finally, similar to the adult ganglionic cells of the sympathetic system, the cells of the ganglioneuroma.

The sympathogonium gives rise not only to the cells of the sympathetic ganglionic series, but also to the lemnoblasts which normally eventuate in the cells of Schwann, to the glioblasts which normally eventuate in the cells of the glia, and, finally, to the cells of the pheochrome system.

The tumors of the chromaffin series may in turn be divided into the less differentiated pheochromoblastoma and the fully differentiated pheochromocytoma. These cells are remarkable for their ability to elaborate the pyrocatechin derivatives, adrenalin and noradrenalin.

The previously cited terms are mere arbitrary designations, introduced for didactic purposes, since in the tumors of the one series are frequently encountered cells with the characteristics of the other and cells in various stages of maturation.

These two series do not differ only in their histologic appearance and pharmacologic behavior but also in their clinical characteristics. The tumors of the sympathetic series occur earlier in life and tend as a whole to be more malignant; they are more frequently bilateral and run a more rapid course. Even within this series of tumors distinctive differences are noted. There are the tumors occurring very early in life (in infants of 3 to 6 weeks of age), which run a rapid and malignant course and tend to metastasize to the liver, the so-called type of Pepper (*Am. J. M. Sc.*, 1901, 121: 287), and the Hutchinson type (*Q. J. M.*, 1907, 1: 33) which develop later than the Pepper type, are less malignant, and tend to metastasize to the bones, dura mater, and, occasionally, to the lungs and mediastinal lymph nodes. The Hutchinson type of tumor tends clinically to produce intracranial hypertension, grave anemia, and, occasionally, blindness. Today's nosologic opinion places the Pepper type with the sympathogoniomic group and the Hutchinson type with the sympathicoblastomas.

The tumors of the chromaffin series are, on the whole, less malignant than those of the sympathetic series; they occur later in life and are quite susceptible to surgical management. Their manifestations of increased blood pressure, either paroxysmal or continuous, of increased basal metabolism with hyperglycemia and glycosuria, and of profuse perspiration are helpful in establishing an early diagnosis. The new adrenolytic substances combat the paroxysmal hypertension incident to the manipulation of the tumor on palpation or during operation, and the new adrenolytic preparations for supporting the blood pressure in the hypotensive state resulting from removal of the tumor have rendered the mortality rate as a result of the operation almost nil.

—*John W. Brennan, M.D.*

Polycystic Kidney; a Clinical Study of 41 Cases. CURT FRANKSSON. *Acta chir. scand.*, 1955, 108: 322.

THIRTY-ONE MALES and 10 females with polycystic kidneys were studied and many of the basic concepts of the disease were reviewed. The youngest patient was 16 years of age and the oldest was 65. Backache, hematuria, or hypertension directed attention to the urinary tract in most instances.

Fourteen individuals died of uremia after an average period of 10 years. Twenty of the living patients have been followed for at least 10 years.

Twenty-seven patients were subjected to simple aspiration, open drainage, or nephrectomy. In a few instances there was temporary relief of pain, hematuria, and/or hypertension. None had any improvement of renal function. Two patients died in uremia after incision of cysts. Four others had serious but nonfatal complications.

In 14 cases treatment consisted of the administration of analgesics, hypotensive agents, transfusions, and allied conservative measures. Late results in this group were as good as those noted in the group that was treated surgically.

Operations are deemed advisable only if the renal function is well preserved. Admittedly, patients without renal impairment are usually asymptomatic and in no need of surgical intervention.

—*Ormond S. Culp, M.D.*

Partial Nephrectomy for Tuberculosis of the Kidney; Conservative Treatment—Operation; A Case of Heminephrectomy. A. STEINBOCK. *Ann. chir. gyn. fenn.*, 1954, 43: Supp. 4.

THE UROLOGIST seldom sees very early cases of renal tuberculosis, for the patients usually have no symptoms of this disease. It is only by routine examinations of the urine and urographic studies of all patients with tuberculosis that the earliest manifestations of renal involvement can be discovered. With the present medical management, the first slight changes, as

demonstrated by the excretory urogram, may be quickly cured, and almost certainly the patient will recover from the renal disease without progressive pathologic evidence of tuberculosis.

Even though patients fail to show diagnostic evidence of pathology in the first examination, repeated examinations may reveal the actual status. While the guinea pig tests and the urinalyses for organisms may not give diagnostic information, the earliest pathologic changes may be demonstrated only by intravenous urography.

The author's experience is based upon the evaluation of about 100 personally treated cases. Without giving any exact figures, he states that in most cases of renal tuberculosis he has had to resort to nephrectomy in the end. What at first appears to be a clinical cure may be only a temporary quiescent process. There may be a change for the worse, for, in spite of clinical silence, the lesion may progress. During conservative treatment, the condition of the ureter must be observed. It is thought that while the antibiotics, especially streptomycin, are very valuable in healing superficial ureteral lesions, at the same time ureteral stricture may arise. It is absolutely necessary to follow up the patient under medical management by means of urograms at regular intervals. Ureteral "modelage" as suggested by Couvelaire, cortisone, and vitamin D may be of value in reducing fibrosis during healing of the ureter. Isoniazid may reduce the formation of fibrosis in the kidney and prevents streptomycin from forming hard scars around the tuberculous lesions. Perhaps these bad ureteral strictures may be avoided by giving isoniazid along with streptomycin.

Partial nephrectomy has been mentioned as a possible treatment for renal tuberculosis. Many well known surgeons tried this type of surgery, but gave it up because the results were not encouraging.

Semb reported 16 cases in 1949 in which operation was done by this method. From December, 1947 to January, 1953 he has done 92 resections on 87 patients without mortality. Since that time, Dufour reported that he had collected 103 cases of partial nephrectomy for tuberculosis at the Forty-fifth French Congress of Urology in Paris.

Partial nephrectomy presupposes early diagnosis as well as definite knowledge of the sites of the lesions. The most suitable cases are those in which the lesions are limited to either pole; however, it is possible to do this operation with the pathologic process in the middle portion of the kidney. There should be no change in the ureter or bladder; however, a slight cystitis is no contraindication to this operation. The author stresses the fact that intravenous urography properly performed is very important in the correct preoperative evaluation of the case. It is his opinion that cystoscopy, "let alone retrograde pyelography," can usually be dispensed with in renal tuberculosis, for he believes that cystoscopy is a serious procedure and should be avoided whenever possible.

There is a difference of opinion as to which cases are suitable for partial nephrectomy. It is thought that the patients being considered for this operation should have lesions that are not of recent origin, and not active. A tuberculous lesion may progress in spite of treatment. For this reason Cibert prefers partial renal resection in relatively early cases. In properly evaluated and selected cases, resection eliminates the focus of infection from the kidney. Cibert also stresses that the patients should not be treated with streptomycin preoperatively. In all of his patients who did not receive streptomycin preoperatively, no parietal complications or urinary fistulas developed. The author's 5 patients who had renal resection were given PAS and isoniazid, but received no streptomycin except in connection with the operation. All of these patients recovered without major complications.

The central question in performing partial kidney resection is that of hemostasis. Semb uses a clamp on the renal vessels for no more than 1.5 hours with much success, although in some cases he has had serious postoperative disturbances in renal function following the use of the clamp to control the renal vessels. A rubber tube around the hilus may be sufficient to control hemorrhage. Dufour recommends manual compression of the renal pedicle. It may also be possible to ligate arterial branches to the affected part of the kidney before resection. It should be remembered that veins cover the arterial branches and that in exposing the latter, the renal artery itself may be damaged, and necessitate removal of the entire kidney.

Partial nephrectomy is a serious procedure that requires good exposure. The incision must be long and the kidney widely exposed. The capsule should not be injured. When removal of one of the poles is required, a curved incision is made in the capsule which is pulled down over both sides of the kidney. The resection itself is almost V shaped, and is made sufficiently far from the focus. To avoid unnecessary necrosis a knife is preferable to diathermy for this purpose. After resection, the cut renal edges are carefully approximated with the interposition of some muscle tissue that may help to control hemorrhage. If the calyces are opened, they must be sutured with fine catgut. It may be best also to suspend the kidney to the diaphragm or support it with hammock sutures.

During postoperative treatment, especially if the remaining kidney is resected, care must be taken to not give the patient too much fluid so as not to exceed the functional capacity of the residual kidney stump.

On the basis of 5 cases, most of them observed for too short a time, the author was not able to draw any definite conclusions as to the value of partial nephrectomy in the treatment of renal tuberculosis. The early results of this type of surgical treatment seem quite promising and should encourage further attempts in suitable cases.

In streptomycin-susceptible cases in which the disease is already strictly localized, partial nephrectomy is a method of treatment that offers much hope in the management of renal tuberculosis.

—*Conrad A. Kuehn, M.D.*

Multiple Endocrine Manifestations in a Patient with Renal Hypernephroma which Disappeared Following Nephrectomy (Multiple endokrine Erscheinungen bei einem renalen Hypernephrom, die nach Nephrektomie schwanden). K. KLIMPEL. *Zschr. Urol.*, 1954, 47: 618.

A 50 YEAR OLD MALE had always been heavy, and even during the blockade of Berlin he continued to weigh

100 kgm. (220 pounds). For the past 6 months he had been suffering from a stubborn thirst; even at night he had to rise and drink a couple of glasses of water. During the past year he had noted a loss of sexual power. His son was 11 years of age.

He presented himself on the author's service because of a severe hematuria. Physical examination disclosed, in addition to the hematuria and the enormous adiposity, a hypertonus (Riva-Rocci 200/130 Hg), polyglobulism (Hb. 115 per cent, an erythrocyte count of 5,800,000), atrophic penis and testes, a general lack of libido (allegedly), and general asthenia. There were numerous brownish frecklelike spots from a mere speck to pea-sized, which of late had increased in size.

Because of the bleeding and the enormous adiposity the palpatory and urogenital tests were not very satisfactory; however, the excretion of dye was delayed and was scanty on the right side. The lower pole of the right kidney seemed to be broadened and thickened and the pelvis and calyces were markedly distorted and lengthened or compressed. The two lowest calyces had completely disappeared.

At operation a coarsely nodular right kidney, the size of a small child's head, was uncovered. Macroscopically it presented the appearance of a hypernephroma. Histologic examination of the tissues of the removed kidney and tumor substantiated the macroscopic diagnosis. The pathologist described the histologic findings as typical of a hypernephroma, or struma renalis (according to Apitz), belonging to the group of relatively well differentiated Grawitz tumors.

All of these details are not unusual but the author considers the postoperative course to be of extreme interest; in fact, in the literature available to him, this is the first reported instance of the disappearance of a diabetes mellitus following the removal of a hypernephroma. In this patient all of the abnormal manifestations cited apparently ameliorated following the operation.

At the time of the follow-up examination (206 days after the operation) the patient felt well, and the wound was closed. The body weight had dropped to 88 kgm., the blood pressure was 140/90, the libido and sexual power had returned to normal, the penis was larger and firmer and the testes were firm and of approximately normal size. The beard was thicker and growing more vigorously; the pigmented spots on the dorsal surface of both hands, although of approximately the same size, were paler in color. There was no urinary sugar and the blood sugar was 70.

The manifestations afforded by this patient are explained by the author on the basis of a hypercorticalism. He believes that the removal of the hypernephroma relieved the adrenal system of an upsetting endocrine influence, and permitted it to return to normal. —*John W. Brennan, M.D.*

Irradiation Therapy in Urology; The Kidney. E. W. Riches. *Brit. J. Urol.*, 1954, 26: 319.

The author stated that convincing evidence of the beneficial effects of combined x-ray and surgical treatment for malignant growths of the kidney has been found. His data indicated that, excluding the purely palliative group, the rate of survival of patients who received postoperative irradiation was greater than that of those who were treated by nephrectomy alone. It is his impression that postoperative x-ray treatment, while being advisable in nearly all cases, is especially indicated (1) in cases of high grade malignancy, (2) in the presence of carcinoma in the renal vein or its spread through the renal capsule, and (3) in cases in which lymphatic metastasis which cannot be removed is found at operation. He further stated that palliative irradiation, while not advisable for pulmonary metastasis, is often successful for metastatic processes involving the lymph nodes or bone. He suggested that a dose of 5,000 to 6,000 roentgens be administered over a 3 week period.

Preoperative irradiation is employed in an effort to convert large or fixed neoplasms to more manageable proportions. For this purpose he employed 3,000 roentgens given over a period of 3 weeks. Palliative therapy is employed to relieve pain and to stop bleeding. He advised that reassessment of operability be made at intervals after treatment.

X-ray therapy is employed in cases of tumors of the renal pelvis as adjuvant therapy to nephroureterectomy if there has been any suggestion of spill of urine or tumor during the operation. The author advised preoperative therapy in cases of Wilms' tumor in which the lesion is too large to be excised safely. He also advised postoperative therapy in the treatment of Wilms' tumor, although he is uncertain of its efficacy.
—*Laurence F. Greene, M.D.*

Ectopic Ureterocele in Infants and Children; a Clinical Study. Nils Olof Ericsson. *Acta chir. scand.*, 1954, Supp. 197.

This monograph of 92 pages, replete with numerous tables, drawings, reproductions of x-ray films, and an extensive bibliography, is a comprehensive review of ectopic ureteroceles in very young patients. The term has been defined as "a ureterocele which invariably reaches down into the urethra, with or without an orifice into that organ." The term "prolapse" is reserved for ureteroceles that protrude from the external urethral meatus.

Twelve cases of ectopic ureterocele were found in the literature and 14 new cases were added. Both groups are reviewed in detail with discussions of the pathologic anatomy and physiology, symptomatology, diagnosis, treatment, and prognosis.

The ectopic ureteroceles are associated with ureteral duplication, involve the ureter draining the upper renal segment, and are accompanied by some degree of hydroureter and hydronephrosis. Pain and recurrent urinary tract infection are common. The diagnosis is made by excretory urography and cystoscopy.

The author advises suprapubic resection of the ureterocele and thinks simple incision is inadequate. Simple nephrectomy or heminephrectomy (leaving the ureterocele in situ) is not recommended. If resection of the ureterocele alone does not eliminate all infection and symptoms, nephroureterectomy is the treatment of choice. In advanced cases a one-stage procedure combining nephroureterectomy and excision of the ureterocele is suggested.

The prognosis depends upon the amount of permanent renal damage. Early diagnosis and prompt treat-

ment will usually result in improved renal function and disappearance of infection. Irreversible changes in the kidney and serious depletion of renal reserve will probably demand more radical therapy.

—*Ormond S. Culp, M.D.*

Ureteroileoplasty (Les urétéro-iléo-plasties). MICHEL-PASCAL BITKER. *J. urol. méd.*, Par., 1954, 60: 473.

FINGER was the first to propose, in 1894, the replacement of the ureter with a loop of intestine. The first application of this surgical procedure in man was reported by Melnikof in 1912. Nissen, in 1940, reported a ureteroileoplasty in a patient in whom an ileal segment was transposed in order to replace a ureter that could not be catheterized. Muller as well as Longuet, in 1949, reported this means of substituting a segment of ileum for the ureters damaged by colpohysterectomy. Ulitzsch in the same year reported this procedure for bilateral ureteral fistulas following amputation of the rectum. Couvelaire published 4 observations on the use of bowel segments to enlarge the bladder and replace the ureter. Various other articles that have contributed to this subject are cited.

Bitker has collected 17 cases of ureteroileoplasty and has included in his article a complete summary of these cases. He also devoted extensive consideration to the experimental study of this operation, along with the technique of the operative procedure, and the preoperative and postoperative care of the dogs that he used in his experimental studies. Two typical cases of ileal substitution of the ureter in dogs were reported. A detailed report including the many phases associated with the use of the bowel in the replacement of the ureter is given. If experimental surgery is contemplated, the perusal of this article is strongly advised.

The surgical technique is demonstrated by drawings. While the technical explanation is described for the dog, its application to the human being can readily be made.

After laparotomy, a well vascularized section of ileum 15 cm. long, or longer, is isolated. The segment chosen must be one that lends itself to transposition, either to replace the right or the left ureter. The portion of the ileum selected is then isolated and the continuity of the bowel and mesentery is re-established by the techniques common to this type of surgery. The proximal end of the free ileal segment is then closed.

The ureter is located and freed from its retroperitoneal position up to the inferior pole of the kidney and down to the bladder. The two leaves of the peritoneum are carefully preserved. The ileal segment is passed through a short incision in the mesocolon near the root. The hiatus is sutured to the side of the mesocolon on the anterior surface of the ileal segment about 15 mm. from the upper end of the transplant. Two parallel, transverse incisions are made 15 to 20 mm. in length and 25 mm. from each other. These incisions do not incise the mucosa. A tunnel is then made between the two incisions and an opening is made through the mucosa into the bowel, a tongue of mucosa being left.

The ureter is ligated and removed to the base of the bladder. A segment of the upper ureter 3 to 4 cm. in length is saved for the future anastomosis with the ileum. The stump of the ureter is bivalved and a No. 0000 catgut suture is placed in the end for traction, and later, to secure the end of the ureter into the ileum. Finally, an elliptical incision is made in the ureteral end (Nesbit), and the stump of the ureter is pulled through the tunnel in the isolated ileum. The ileum is opened by a small bistoury and the opening is suitably enlarged and the excess mucosa cut away. The suture in the end of the ureter acts as a tractor and, later, as an anchoring stitch. The transverse openings in the ileum are then closed with interrupted sutures. The lower extremity of the ileal graft is attached to the bed of the ureter or at a suitable portion of the bladder. Two layers of the ileum are anastomosed to the bladder, the first layer being the posterior seromuscular one and the second, the anterior seromuscular layer, with additional sutures placed as necessary.

The posterior parietal layer is attached to the ileal loop and the perirenal peritoneum is placed so that the new ureter is without tension. The abdominal wall is then closed in layers to complete the operation.

From the author's experiments and his findings in a study of the physiologic basis for using the bowel as a substitute for the ureter, he submitted the following conclusions:

The absorption from the intestine depends in part upon the osmotic contents of the intestine; thus, the absorption of the urinary contents after ureteroenterostomy is less if the implantation of the ureter is made in an isolated segment of bowel. Three factors govern the absorption of urea and chlorides: (1) the osmotic concentration of the urine; (2) the mucous surface of the exposed intestine in contact with urine; and (3) the time that the urine remains in contact with the intestinal epithelium.

It is easy to control the first two factors by avoiding the use of too long an ileal segment, more than 25 to 30 cm., thus assuring an absorbent surface that will permit sufficient dilution of the urine. After ureteroileoplasty, the third factor is modified by the function of the neoureter. The urine transverses the ileal segment in a continuous flow, thus providing for the absence of stasis and rapid emptying of the urine from the neoureter. The volume of urine within the segment remains small; thus, the absorption of the urine from the ileal segment remains below that found experimentally.

There are several variations of this operation, depending upon the site and extent of the lesion as well as on the unilaterality or bilaterality of the ureteral disease.

The ability of the neoureter to function properly has been studied during the course of this work. The continued function of the kidney can be used as a means of determining the value of the ileal segment to function as a substitute ureter. The neoureter is inevitably associated with reflux during micturition. In order to reduce the absorption of urine from the isolated segment and also reduce the reflux of urine, vesical distention should be avoided by frequent bladder evacuations.

Ureteroileoplasty is indicated in special cases of urinary lithiasis: (1) when it becomes necessary to re-establish the continuity of the ureter in complica-

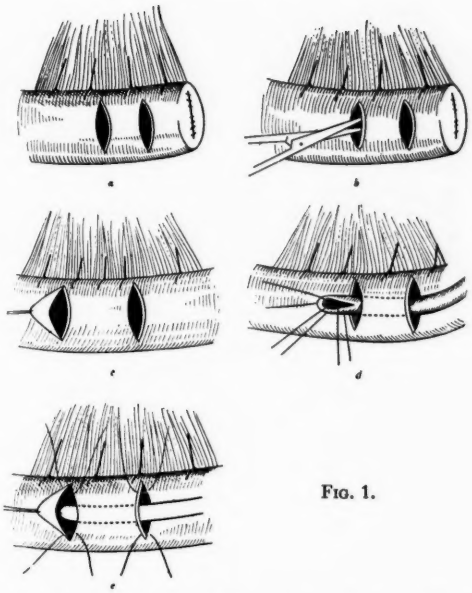

FIG. 1.

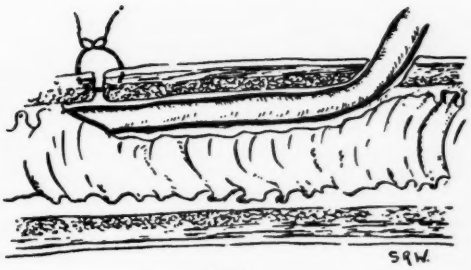

FIG. 2.

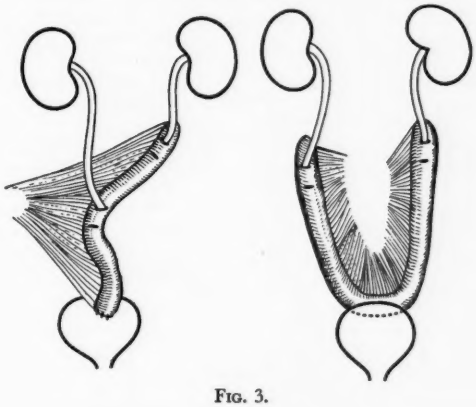

FIG. 3.

Fig. 1. (Bitker). The different steps in the ureteroileoanastomosis.

Fig. 2. Longitudinal drawing of the completed anastomosis.

Fig. 3. Variation of ureteroileoplasty, bilateral.

tions of calculous disease, such as in cases in which the ureter has been perforated during instrumentation or when it has been subjected to repeated ureterostomies; (2) in the cases in which the patient develops an extensive stricture of the ureter and when the ureter has been involved in a cicatricial process associated with abscess formation and a periurethritis.

If the patient has only one kidney and the ureter, because of disease, is not able to function properly, ureteroileopyeloplasty should be considered as a surgical procedure. In cases of bilateral renal lithiasis, it may be advisable to consider this operation. When over 2 cm. of the lumboiliac ureter have been resected, substitution of the ileum for the destroyed ureter may be necessary.

In patients who have abdominopelvic cancer, it may be necessary to remove large sections of the ureter in order to remove the cancer adequately. If the re-establishment of the ureter by using an ileal segment can be done at surgery, the kidney may be saved. In cases in which the ureter is damaged during colpohysterectomy or amputation of the rectum, the injury may result in ureteral necrosis or a fistula may develop, and ureteroileoplasty should be considered. This operation depends also upon other factors, such as the unilaterality or bilaterality of the lesion, the age and social condition of the patient, the life expectancy following definitive surgery (local extension and metastasis), and the histological type of tumor.

Special cases of megaloureters might offer an indication for ileal substitution. An ureteroileoplasty could be used to replace a ureter that had been removed for primary ureteral tumors. Nonoperative trauma to the ureter may readily be an indication for this operative procedure. Ureteral injuries frequently go unrecognized and are later discovered either by abscess or fistula formation.

The author has collected 17 cases of ureteroileoplasty and reviewed these cases in detail.

In summary, this article deals extensively with the experimental work associated with the substitution of an ileal segment for the ureter. The work was done at the Surgical Research Laboratory and at the Urological Clinic at the Cochin Hospital, Paris. The author reviewed the literature on this subject and the article has an extensive bibliography. The clinical application of ureteroileoplasty in 17 patients suggests a valuable addition to the surgical armentarium when the ureter is the site of extensive disease.

—Conrad A. Kuehn, M.D.

BLADDER, URETHRA, AND PENIS

Management of Bladder Neck Obstruction in Children. EDGAR BURNS, A. MILES PRATT, 11, and ROBERT G. HENDON. *J. Am. M. Ass.*, 1955, 157: 570.

IN SUMMATION of their fine paper, the authors have stated that the management of bladder neck obstruction in children is fundamentally the same as in adults. The types of obstruction encountered include contracture of the internal vesical orifice, congenital prostatic valves and, rarely, hypertrophy of the colliculus seminalis.

Early recognition of bladder neck obstruction is imperative, for, in the early stages cure can be obtained by surgical removal; if the condition is left uncorrected, irreversible renal damage is inevitable. Complete study of the urinary tract is important in an evaluation of the pathologic changes that have occurred in the urinary tract above the obstruction. This includes chemical and bacteriologic urinalyses, evaluation of renal function, urography, and cystourethroscopy.

Treatment consists of surgical removal of the obstruction by a modified retropubic approach or by a transurethral resection supplemented by measures to correct secondary complications. These are described in detail. No postoperative deaths occurred in the authors' cases. —*Robert Turell, M.D.*

Vesical Orifice Obstruction in Women and Its Treatment by Transurethral Resection. DAVID M. DAVIS. *J. Urol.*, Balt., 1955, 73: 112.

THE AUTHOR analyzes 56 cases of obstruction of the vesical orifice treated by transurethral resection. Frequency, difficulty, pain, and infection are the prominent features of the clinical picture in most of the cases. On examination, all patients showed contracture of the vesical orifice of greater or less degree. In several cases there was present what might well be called median bar formation. Several patients presented varying degrees of muscular hypertrophy and trabeculation. In some there was marked stenosis of the external meatus, requiring meatotomy. The operative enlargement of the vesical orifice was carried out with use of the McCarthy resectoscope and subsequently it was possible to report good results in 82 per cent of the cases.

In the diagnosis of lower urinary tract obstruction in the female, the patient must be questioned precisely regarding frequency, difficulty or straining, hesitancy, small weak stream, interruption, multiple voiding, urgency, leakage of urine during the day or night, and pain or burning. In this group, no deaths or operative complications occurred. The author cautions that one must remember he is not removing large masses of tissue, as in operations on the prostate gland. One should therefore shave away tissues in thin layers, never cutting to the full depth of the loop. A finger in the vagina may be very helpful, and if the amount of tissue removed is not quite adequate, it is always simple enough to remove a little more. In many cases the most gratifying results follow removal of amounts of tissue which seem ridiculously small to those who are accustomed to operating on the prostate gland. The convalescence after transurethral resection is often more uncomfortable in females than in males. Some may complain of burning and frequency for rather prolonged periods of time.

The author states that transurethral resection is very valuable in the female when the expulsive force of the bladder is absent or subnormal, as a result of neurogenic conditions. He concludes that transurethral resection is the only satisfactory and practical method of relieving lower urinary tract obstruction in the female which does not respond to mechanical dilatation, and that it is a safe procedure if the precautions taken are the same as those observed in the male. Pain and/or infection in one kidney, or in both, may be relieved by enlarging the vesical orifice if there is no organic ureteral obstruction. —*Robert O. Beadles, M.D.*

Fibroma of the Urinary Bladder (Il fibroma della vescica). VINCENZO ZAFFAGNINI. *Ann. ital. chir.*, 1954, 31: 189.

THIS 53 year old male patient, without history of tumor taint in the family, had suffered an attack of typhoid at 21 years of age and a 2 months' siege of acute glomerulonephritis at the age of 25. At 27 years of age he began to have symptoms of renal calculus and 20 years later a pyonephrosis necessitated a nephrectomy on the left side. Two years previous to the present attack edema of the lower extremities, asthenia, headaches, and an azotemia (2.60 gm. pro mille) had appeared.

A month previous to admission on the author's service, the patient suffered a sudden attack of urinary retention, requiring the insertion of an indwelling catheter. Cystourethroscopy disclosed a deformity on the right side of the vesical neck suggesting the presence of a large prostatic lobe; it was irregularly rounded and with a smooth surface.

Suprapubic cystotomy revealed a spherical pedunculated tumor, the size of a hen's egg, attached to the posterior margin of the vesical neck. It was removed by dividing the pedicle. The reddish-gray tumor weighed 30 gm. On its surface was bladder mucosa and, in some places, granulation tissue.

Microscopically, the new growth was found to be composed of rather loosely and irregularly woven fibrous tissue elements with, in places, a marked edematous appearance. Mitoses were few and not atypical and there was little evidence of anisocytosis. Capillaries were numerous. Here and there was evidence of inflammatory changes. The histologic diagnosis was fibroma molle.

Five years later there had been no recurrence, and there was no disturbance of urination. This tumor is the thirty-fourth verified vesical fibroma reported in the world literature. A study of the cases reported shows no preference as to sex, but a major incidence between the forty-ninth and fifty-ninth years of age. One case has been reported in a 4 year old child. Two general types—pedunculated and sessile, and infiltrating—have been reported. Fibroma dura and fibroma molle have been described.

The symptoms depend on whether the tumor arises from the submucosa or from the fibrous tissues of the deeper layers of the bladder wall. The chief symptoms in the first group are dysuria, hematuria, and urinary retention. The symptoms of the deep fibromas are those of a tumor of the small pelvis.

Removal of the tumor has usually resulted in permanent cure. The recurrences which have been reported have probably resulted from incomplete removal of the original growth.

—*John W. Brennan, M.D.*

Advantages of Transurethral Removal of Certain Bladder Tumors. GERSHOM J. THOMPSON. *J. Urol.*, Balt., 1955, 73: 270.

THE AUTHORS of this article discussed a series of 300 cases in which a grade 3 or 4 (Broders' classification) vesical neoplasm was treated at the Mayo Clinic by a transurethral method, either alone or in combination with irradiation therapy, during the years prior to 1949.

They believe that urologists have for years pretty well agreed that in the majority of cases tumors of the bladder of low grade malignancy can be best removed by transurethral methods. As a result of this study and the authors' experience in recent years they have formed the opinion that a tumor of high grade malignancy which has not infiltrated beyond the bladder wall and which can be accurately delineated is also best removed by transurethral operation if such is technically possible.

When a tumor has infiltrated into the perivesical tissues or beyond, the transurethral removal of its grossly visible portion followed by irradiation therapy intended to destroy the microscopic portions which remain is preferable to open operation. When the extent of a tumor of high grade malignancy cannot be accurately determined with the cystoscope and when tumors of low grade recur with great rapidity both in size and number, transurethral methods of treatment are not advantageous; in such cases cystectomy probably holds more promise of cure.

The 5 year survival rate in this series of cases treated by transurethral surgery plus selective irradiation seemed better than the results with similar cases which had been treated by open surgical methods.

The authors believe that transurethral excision of vesical tumors combined with irradiation such as is now available with the cobalt bomb apparatus will in time prove superior to all other methods of treatment which have so far been used.

Use of Radioactive Cobalt (Co_{60}) in Nylon Sutures in the Treatment of Carcinoma of the Bladder; Preliminary Report. VINCENT VERMOOTEN. *J. Urol.*, Balt., 1955, 73: 280.

THE AUTHORS offer a new method of radiation, believed to be most satisfactory for treating carcinoma of the bladder, especially the extensive infiltrating type which is considered inoperable, or as requiring total cystectomy. This modality makes use of radioactive cobalt sewed into tumor tissue in nylon sutures. This compound is a gamma-ray emitter producing practically no ionization of tissues and consequently no scar such as results with highly ionizing beta radiation. The sutures can be accurately placed and evenly spaced in the tumor to obtain an almost perfect irradiation pattern.

The treatment described was first used in a patient with severe urinary symptoms who was suffering from an extensive infiltrating carcinoma involving most of the floor and the left lateral wall. The left ureteral orifice was also involved with some dilatation of the left ureter. After cystotomy, a large needle carrying a nylon suture containing radioactive cobalt was passed lengthwise through the bladder along the outer edge of the palpable tumor. Subsequent sutures were then passed through the wall of the bladder and the carcinoma, each parallel to the other, and a centimeter apart. Both ends of each nylon suture were brought out through the suprapubic wound and removed after a period of six days.

Six weeks later the capacity of the bladder increased from 100 c.c. to 300 c.c. Cystoscopically, except for edema about the trigone, the bladder was of normal appearance. Six months later the bladder was reopened and cobalt sutures were placed about the trigone and internal sphincter for what appeared to be local carcinoma. A month later the patient was symptomatically well despite probable metastases and there was no cystoscopic evidence of growth.

A similar satisfactory result was obtained in a recently resected extensive carcinoma of the prostate by placing the sutures in the prostatic bed.

Urograms and photographs accompany the descriptions.

—*Allan K. Swersie, M.D.*

A New Operation for Creation of an Artificial Bladder with Voluntary Control of Urine and Feces. OSWALD S. LOWSLEY and THOMAS H. JOHNSON. *J. Urol.*, Balt., 1955, 73: 83.

THE OPERATION discussed consists of using the isolated rectum as a new bladder, and creating a new rectum by mobilizing the sigmoid colon to sufficient length to permit its being pulled through the perineum immediately anterior to the anus but under the external sphincter ani muscle. This muscle thus encircles both the anus (outlet for the urine) and the sigmoid stoma (outlet for the feces), providing complete separation of the fecal and urinary streams, together with voluntary control of the feces and urine.

Preoperative bowel preparation is accomplished by the use of neomycin and thalamyd by mouth, combined with flooding the lower bowel with a neomycin solution prior to surgery.

At operation, both ureters are transected as far distally as is possible and the rectosigmoid is transected at the lowest level at which the ureters will be easily transplanted into the rectosigmoid, which is accomplished by a mucosa to mucosa technique. The cut end of the rectosigmoid is then closed, completing the new bladder. The next step is to free the proximal sigmoid of attachments and provide enough length to allow feces to pass through the rectovesical space under the external sphincter ani, and out the perineal incision. In lithotomy position, a semicircular incision is made anterior to the anus, and dissection is carried under the external sphincter ani and anterior to the rectum until the peritoneal cavity is opened; the sigmoid is then drawn down through this incision. The mucosa of the sigmoid is sutured about 1 to 2 cm. beyond the skin edge. The original position is resumed and the abdominal incision is closed.

The authors have 2 patients in whom this procedure has been carried out. The operations were performed more than 6 months prior to the time of the present

report. Both patients had transitional cell carcinomas of the bladder for which cystectomy was performed, the first having a one-stage, and the second a two-stage procedure. Both have voluntary control over feces and urine. Two to three movements of formed stool and four to eight urinary voidings daily are the rule. There is no involuntary loss of urine or feces, and no dressings or special apparatus are required. The capacity of the bladder in both cases is 300 to 350 c.c., and a desire to void occurs at over 200 c.c. Cystoscopic examinations were accomplished easily in both bladders and the ureteral orifices were located by indigo carmine injected intravenously. Cystograms showed good sphincteric control over the bladder contents. One patient has a mild hydroureter and hydronephrosis due, probably, to an increase in pressure in the rectum as compared to the normally low pressure in the urinary bladder. The blood chemistries of both patients have remained essentially unchanged since operation.

This new procedure is indicated in any condition requiring urinary diversion, where the underlying pathologic process is not likely to prove fatal in a short time. It is the author's belief that this operation offers a greater hope of longevity combined with patient comfort than any method of diverting the urine now in use. —*Robert O. Beadles, M.D.*

The Experimental Use of Seromuscular Grafts in Bladder Reconstruction; Preliminary Report. William C. Shoemaker and Horace D. Marucci. *J. Urol.*, Balt., 1955, 73: 314.

A new method for plastic reconstruction of the urinary bladder, with the use of seromuscular grafts from the terminal ileum and colon, is described and observations regarding the functional capacity and physiological characteristics of the reconstituted organ are presented.

The repair of defects and reconstruction of the bladder have been attempted with a variety of materials such as free fascial grafts, segments of intestinal tract, pleura, peritoneum, and gall bladder. Shrinkage of the graft or absorption of urinary constituents and persistence of mucus-secreting intestinal epithelium have created serious drawbacks.

Among the criteria sought in a new approach to the problem of bladder reconstruction were the following requirements:

1. Large areas of the potential graft must be pliable and mobilized without jeopardizing the intact blood supply.
2. The graft should allow regeneration and regrowth of the normal bladder transitional epithelium.
3. The graft should have an inherent functioning muscle layer.
4. The graft should not absorb electrolytes or nitrogeneous wastes and should not produce mucus or irritating substances.

Experiments on 10 dogs were carried out with methods and material meeting the criteria set forth. Under intravenous nembutal a loop of ileum or colon approximately 10 to 20 cm. in length was isolated. A longitudinal incision through the bowel wall of the loop was made approximately ½ to 1 cm. from the mesenteric border. The mucous membrane was elevated and completely removed from the muscular layers. The flap was then folded transversely with the serosal surfaces facing each other; the two leaves were united by means of a continuous suture placed ½ to 1 cm. from the mesenteric border on the opposite side of the mesentery as the previously described longitudinal incision. Thus a "hod" shaped seromuscular flap with a mesenteric pedicle was created. Approximately 90 per cent of the bladder was resected, leaving only the trigone and a narrow margin of residual vesical tissue around the urethra and ureteral orifices. The graft was then brought inferiorly to the region of the bladder and vesical remnant.

Excretory urograms, cystograms, and cystogram studies were done under very light anesthesia. Residual urine and capacity were estimated. To determine the absorptive pattern of the graft, blood chemistries including urea nitrogen, chlorides, and carbon dioxide combining power were taken preoperatively, and at intervals throughout follow-up periods up to 4½ months. Five of the animals were sacrificed at periods varying from one week to 3½ months, with removal of the entire genitourinary tract and graft area with its mesenteric pedicle for sectioning.

The summary of results of the 10 dogs used in this series are presented in table form indicating complications, bladder capacities, and residual urine. Cystometrograms, graphs of blood chemistry determinations, pyelograms and histologic sections are presented. The following general results are noted: Histologic sections showed gradual development of transitional cell epithelium in the area previously occupied by serosa. This was complete in 7 weeks. In all instances intact muscle layers and abundant vascularity were noted. Resultant normal voiding ability, absence of residual urine, blood chemistry studies, urograms, cystograms, and cystometrograms indicated essentially normal dynamics and urinary tract function.

—*Allan K. Swersie, M.D.*

Injuries of the Urethra in Children (Verletzungen der Harnroehre bei Kindern). S. Petković. *Zschr. Urol.*, 1954, 47: 737.

Injuries of the urethra in children are comparatively uncommon. In a period of 8 years, 140 injuries of the urethra were seen in adults, but only 7 were seen in children. Urethral tears in boys are usually due to a fall astride some hard object which causes injury to the perineum and the urethra. On the basis of his experience with 7 cases the author suggests the following management:

Following the injury the child may or may not be able to void. If he can void, the author recommends avoidance of catheterization. However, 3 weeks later the urethra should be dilated to make certain that a stricture has not developed. If the child cannot void, an attempt must be made to pass a catheter, and if this is possible the catheter should be left indwelling. Collections of blood in the perineum must be emptied and if catheterization is not possible an immediate cystotomy and retrograde catheterization are suggested. A catheter should be left indwelling for about a month, and the urethra must be dilated with bougies at intervals afterward. In the past, it has been advisable to repair the injured urethra about 2 or 3 weeks after the acci-

dent, but with the advent of antibiotics the author believes that an immediate attempt may be made to repair the torn urethra. Intermittent bouginage of the urethra must be continued for a long time after the injury. —*S. Richard Muellner, M.D.*

Sudden Death As a Result of the Entrance of an X-Ray Contrast Medium Into the Circulation Through Perforation of the Urethra; Barium Sulfate Shock (Ploetzlicher Tod infolge des durch die Harnroehrenperforationen in den Blutkreislauf gelangten Roentgenbreies (Barium-sulfatschock). I. Gy. Fazekas. *Zschr. Urol.*, 1954, 47: 673.

Two instances of sudden death following the intraurethral injection of a 10 per cent barium sulfate suspension are reported. Two additional deaths from the same cause had previously been reported by Gaudin (1950), and Ball and Pelz, respectively.

In the author's cases the injection of a 10 per cent barium sulfate suspension into the strictured urethra of two elderly men proved to be fatal. Both men died from shock in about 8 to 10 minutes. At autopsy there were 5 perforations of the urethra in the first patient and 4 in the second. Much of the barium was found in the corpora cavernosa and also in the pudendal plexus and in the hypogastric veins. No barium sulfate emboli could be seen in the lungs by means of x-rays, nor were any emboli found at autopsy. The abdominal organs apparently contained some barium, which was demonstrated by chemical tests.

The author believes that the deaths were due to a histaminelike reaction which resulted from the barium sulfate in the circulation.

—*S. Richard Muellner, M.D.*

GENITAL ORGANS

Progress in Perineal Prostatectomy; Results in 2,050 Consecutive Patients. Edwin Davis and Leroy W. Lee. *J. Urol.*, Balt., 1955, 73: 142.

Perineal prostatectomy today, under innocuous (caudal) anesthesia, offers opportunity for painless, deliberate, precise anatomic dissection, clear visualization, accurate hemostasis, and plastic closure with normal anatomic restoration. Following this technique, uneventful convalescence with per primam healing, minimum hospitalization, and excellent functional results are the rule rather than the exception. In brief, the prognosis, with respect to hazard and late results following prostatectomy in the aged and debilitated has come to compare favorably with that following appendectomy in the young and robust. Notwithstanding the ravages of age and the inexorable law of the averages, an exceedingly low mortality rate may be maintained. Uncontrollable (and in a large percentage unrelated) vascular "accidents" are responsible for approximately half of the deaths. In the author's series of 2,050 consecutive perineal prostatectomies the over-all mortality rate from all causes was 2.9 per cent.

Plastic closure and the newer antibiotics and sulfonamides have contributed largely to the spectacular shortening of postoperative hospitalization which in the last 50 of the series averaged 11.3 days. Of the chief causes for concern ordinarily associated with prostatic surgery, hemorrhage, sepsis, fistula, stricture, incontinence, and vascular "accidents," only the last remains more than a minor problem. Only on two occasions in the last 9 years has the transurethral aspiration of clots and fulguration of bleeding points been necessary. Postoperative transfusion has been conspicuously rare. In no instance was transfusion necessary during the operation. There have been no massive secondary hemorrhages during the past 6 years.

Increasing public prostate-consciousness, resulting in general realization of the hazard and added hospital cost incident to delay, has brought patients in earlier, permitting safe intervention without delay, and preliminary drainage is reserved for those patients with large residuals or elevated nonprotein nitrogens. Today prostatic surgery need not be dreaded, but rather welcomed as a means of relief. The decision comes to be merely a matter of the weighing of alternatives. The patient with residual urine and obstructive symptoms needs but to balance the minimum risk and discomfort of surgical intervention against the increasing risk and suffering, and the final inevitable consequence of continued neglect.

—*Robert O. Beadles, M.D.*

Prevention of Osteitis Pubis in Retropubic Prostatectomy (Die Vermeidung der postoperativen Osseitis pubis bei retropubischer Prostatektomie). Ladislaus Hencz. *Zschr. Urol.*, 1954, 47: 706.

Osteitis pubis is said to occur in 4 to 14 per cent of patients who have had a retropubic prostatectomy. The cause of this crippling complication has not been definitely established. There appear to be two separate concepts of its etiology. It is believed by some to be due to infection in the space of Retzius; others maintain that it is brought about by injury to the blood supply and to the trophic nerves of the symphysis pubis. Cibert (*Brit. J. Urol.*, 1952, 24: 3.) strengthened the belief that osteitis pubis is due to infection by opening the space of Retzius in a number of patients who had this complication and demonstrating a residual abscess or inflammatory granulation tissue.

Taking Cibert's view as the most probable cause of osteitis pubis, the author modified his operative technique of retropubic prostatectomy in a manner to prevent the occurrence of infection in the prevesical space and thus hoped to avoid this complication.

The author emphasizes the avoidance of needless injury to the periprostatic veins. These are pushed aside bluntly without being severed. Ligatures are used sparingly and only 4 to 5 stitches are employed to close the prostatic urethra. Tamponade in the space of Retzius is avoided and great care is taken not to injure the periosteum of the symphysis. The incision in the prostatic capsule is made vertically instead of transversely, as is customary. This type of incision is more easily closed without any injury to the periosteum. The suprapubic dressing is not changed until the fifth postoperative day. The drain is removed on the seventh or eighth day and then brought up a little at a time. With this technique the author has completed a consecutive series of 280 retropubic prostatectomies without a single case of osteitis pubis.

—*S. Richard Muellner, M.D.*

MISCELLANEOUS

Urinary and Fecal Incontinence Due to Congenital Abnormalities in Children: Management by Transplantation of the Ureters to an Isolated Ileostomy. OLE J. JENSEN, JR., HAROLD E. EGGERS, ALEXANDER H. BILL, and DAVID R. DILLARD. *Tr. West. Sect. Am. Urol. Ass.*, 1954, 21: 27.

THE COMBINATION of urinary and fecal incontinence due to congenital nerve defects presents a most difficult problem inasmuch as the ureters obviously cannot be transplanted to the rectum or sigmoid in the usual manner.

The authors, faced with 2 such cases, concluded that the most feasible solution to the problem would be the use of the so-called Bricker procedure. In this operation a short segment of terminal ileum is isolated. The proximal end of the segment is closed and placed at the sacral promontory and the open distal end is led out through the abdominal wall. The ureters are transplanted to the proximal portion of the isolated ileum which then acts as a conduit from the ureters to the skin where the urine can be collected in an ileostomy bag adherent to the skin.

The cases of 2 children with both urinary and fecal incontinence due to congenital abnormalities are presented. The Bricker procedure was performed. The fecal incontinence has been readily managed by a mildly constipating diet and simple enemas. Previously existing hydronephrosis has shown improvement in each case. Urinary infection previously present has been eliminated. The blood electrolyte patterns have been found to be normal at 9 and 15 months after operation.

Intracavitary irradiation was employed in the treatment of diffuse papillomatosis and extensive superficially infiltrating carcinomas. Radioactive cobalt (Co^{60}) was employed as a solid source of radiation placed at the center of a balloon which was passed into the bladder and distended. The amount of radioactive cobalt was such that a total dose of 6,500 to 7,000 roentgens was given to the surface of the bladder in two treatments of 3,500 roentgens each at weekly intervals. The tumor-lethal dose of radiation extends only to a depth of 6 mm., and therefore there must be no deep penetration of the tumor and no projection of papillomas into the bladder beyond 5 mm. Large papillomas must be resected or fulgurated prior to irradiation. A metal catheter which incorporates a distensible bag devised by Millin was employed.

During 1951 and 1952, 18 patients comprising 6 cases of diffuse papillomatosis and 12 cases of extensive superficial carcinoma were treated by intracavitary irradiation. Contraction of the bladder, a distressing complication of this therapy, was noted in 3 instances. Residual tumor persisted among 5 of 6 patients having diffuse papillomatosis treated by intracavitary irradiation and a papilloma recurred in the remaining patient at a later date. In each instance, however, the papillomas had been brought under control and cystectomy avoided. The deaths of 6 of 12 patients with diffuse or multiple carcinomas treated by intracavitary irradiation were caused by their tumors within 4 to 18 months after treatment. It appeared probable that the method was employed in unsuitable cases. Six patients remained alive and 3 were free of tumor. —*Laurence F. Greene, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Multiple Symmetrical Zones of Reconstructed Bone (Milkman Syndrome) of Unusual Etiology and Location (Multiple symmetrische Umbauzonen (Milkman-Syndrom) ungewoehnlicher Aetiologie und Lokalisation). G. LIESS. *Fortsch. Roentgenstrahl.*, 1955, 82: 15.

"UMBAUZONEN," according to the author, represent a physiologic response to stress in pathologically weakened bone, as occurs in osteomalacia. If the stress becomes excessive, fracture occurs. These zones have been observed in vitamin D deficiency, renal osteodystrophy, hyperparathyroidism, nephritis, and idiopathic hypercalcemia.

In all of these cases osteomalacia is present; the bone becomes brittle and loses elasticity. Microscopically these areas show absorption of old bone, deposition of osteoid tissue, and proliferation of fibrocartilaginous tissue. Diagnostically, their location is important. In statically overloaded bone they are seen in the lower extremities; in biologically altered bone they are of symmetrical distribution and occur in both the lower and upper extremities. Because of muscle pull around the joints, they occur in the metaphysial areas of the long bones. When they are present near the epiphyses the differentiation from Sudeck's atrophy is very difficult.

Three cases are presented. In the first, the Milkman Syndrome was associated with generalized neurofibromatosis and relative resistance of the tissue to vitamin D. The "umbauzonen" were symmetrically distributed. The second and third cases were the result of acidosis and showed many atypical zones in the epiphysial lines, as well as spontaneous fractures and osteoses. —*George Wichman, M.D.*

Spondylolisthesis in Children and Adolescents (Le spondylolisthesis chez l'enfant et l'adolescent). W. TAILLARD. *Acta orthop. scand.*, 1954, 24: 115.

THE AUTHOR has reviewed 50 cases of spondylolisthesis in patients of 5 to 20 years of age, whose cases were followed up at Balgrist Clinic, in Zurich. There were 25 males and 25 females. In 14 patients there was a history of trauma and in 21, spina bifida. Forty-seven of these patients were treated by a bone-grafting procedure.

The symptoms in children are similar to those seen in adults except that two-thirds of the patients under 15 years complained of sciatic pain, whereas, over this age the number of patients with sciatic involvement was just one-third. In the first group Lasegue's sign was positive in a large number of cases, but abnormalities of the reflexes and sensations were seldom encountered.

A very interesting consideration was suggested by the roentgenographic studies. The progression of vertebral slipping is more likely to occur in cases in which the upper portion of the sacrum is rounded, and the posterior part of the body of the fifth lumbar vertebra is narrower than the anterior part. On the other hand the vertebral slipping will probably not increase if the superior sacral border is flat and the fifth lumbar vertebra is of normal shape.

In the author's series, reduction of the deformity was attempted in 13 cases and was partially successful in 7. The reduction is done according to Scherb's technique with the patient lying on his abdomen on a plaster bed which reaches down to the level of the iliac crests, leaving the pelvis free and tending to angulate forward. Traction is applied to the pelvis by means of a corset. The patient is required to remain in this uncomfortable position for 20 to 30 days and a bone graft is then applied. In only one case was the graft successful in maintaining the reduction. In all other cases the vertebral slipping recurred during or after the operation because of pseudarthrosis or bending of the graft.

The author emphasizes that the patients with a normally shaped upper sacrum and with only slight flattening of the border of the fifth lumbar vertebra did not present any increase in the spondylolisthesis, even when pseudarthrosis of the graft did occur.

The author concludes that it is useless to try to correct the spondylolisthesis by means of a lumbosacral arthrodesis, but he admits that this procedure is successful in arresting the pain in 66 per cent of the cases. —*Fernando Aleu, M.D.*

A Contribution to the Differential Diagnosis of Osteochondritis Deformans Juvenilis; Calvé-Legg-Perthes' Disease; Tuberculosis Coxitis. (Beitrag zur Differentialdiagnose: Osteochondrosis deformans coxae juvenilis (Calvé-Legg-Perthes) Coxitis tuberculosa). B. LOERBROKS. *Zschr. Orthop.*, 1955, 85: 573.

SCHMID stated that 20 per cent of all cases diagnosed as tuberculosis of the hip should have been diagnosed as Perthes' disease. The first symptoms that send these patients to their physicians are pain on walking (usually in the knee joint), limp, and a tired feeling. A history of trauma is usually obtained. A positive tuberculin elevated sedimentation rate and changes in the blood picture may point to either one of the afore-mentioned conditions. A shortening of the prothrombin time and endocrine disturbances cannot definitely be associated with Legg-Perthes' disease, although frequently present in this condition. Flexion contracture of the right hip is seen more frequently in tuberculosis of the hip than in Perthes' disease.

In many cases of Legg-Perthes' disease, the following final picture was observed: shortening and widening of the neck, a high-riding greater trochanter, flattening of the acetabulum, a mushroom-type deformity of the head, and a ring of new bone formation around the epiphysis which is characteristic of this condition.

The author presents a case to illustrate the difficulty of diagnosis between Legg-Perthes' disease and tuberculosis of the hip. —*George I. Reiss, M.D.*

Sacralization; an Etiologic Factor in Lumbar Intervertebral Disc Lesions, and a Cause of Misleading Focal Signs. JOHN ANDREW. *Brit. J. Surg.*, 1954, 42: 304.

THE AUTHOR emphasizes the occurrence of occult sacralization described by O'Connell. He believes that it is an intermediary stage between the normal skeletal arrangement in the lumbosacral spine and full sacralization. It is characterized by a highly placed sacrum in relation to the inlet of the false pelvis. In these cases there are six sacral vertebral segments and five pairs of sacral foramina. The transverse processes of the fifth lumbar vertebra are usually larger than those above and the last identifiable ribs are abnormally long. The spine of the fifth lumbar vertebra may be sufficiently high as to be level with or just below the iliac crest.

Sacralization, either frank or occult, occurred one hundred and five times in a series of 150 patients who were proved at operation to have a herniated intervertebral disc. These conditions occurred seventy-four times in a control series of lumbar spines. The author believes that this anomaly predisposes to herniated intervertebral disc by rendering the lumbar spine less stable than normal.

In patients with either frank or occult sacralization, the neurologic signs and symptoms are often at variance with those expected from the level of disc protrusion. The reason for this is obvious in frank sacralization but is often overlooked in cases of occult sacralization in which the last lumbar vertebra may in reality be the fourth, and therefore disc protrusion at the last intervertebral space will interfere with the function of the fifth lumbar instead of the first sacral root.

—Norman J. Rosenberg, M.D.

The Internal Architecture of the Femur and Its Clinical Significance; the Upper End. WILLIAM J. TOBIN. *J. Bone Surg.*, 1955, 37-A: 57.

A KNOWLEDGE of the internal architecture of the femur is most essential for the proper management of hip fractures and arthroplasties of the hip joint.

The historical background is discussed in considerable detail. The illustrations of the trabecular patterns are excellent. The effects of stress, muscle action, shearing strains, and bending forces are discussed. The cross section of the upper femur in a nonweight-bearing animal (the sloth) is shown for comparison. Here the trabecular pattern is nondescript.

The chief clinical significance of this data is in the proper placement of triflanged nails and the selection and placement of prostheses in hip joint arthroplasties. A nail driven up the central part of the head and neck is a poor nailing. The position of choice should be more valgus, with the nail abutting against the thickened calcar. The same principles apply in placing the Judet type of prosthesis. Here also the stem must rest against the reinforced inferior aspect of the neck. Lack of understanding of this principle leads to central placement of the Judet stem. This is probably the reason for the high percentage of failure in this type of prosthesis. The difficulty is overcome by the design of the intramedullary type of prosthesis, such as that of Austin Moore or Fred Thompson. The inferior portion of these prostheses rests directly on the femoral calcar and the lateral aspect of the stem abuts against and thickens the lateral cortex of the femoral shaft.

—D. Keith McElroy, M.D.

Flat Foot and Neurofibromatosis of Recklinghausen; Type Thibierge. (Pied plat et neurofibromatorace de Recklinghausen type Thibierge). F. DE MORAES. *Chir. org. movim.*, 1954, 40: 188.

EIGHTEEN CASES of flat foot and Recklinghausen's neurofibromatosis are reported by the author. There was a stubborn form of pes planus in the patients which resisted all types of conservative treatment, and in each there were also the "coffee with milk" spots of Ducroquet and the so-called metatarsus primus brevis or mobilis of Morton (Morton, D. G. *The Human Foot.* Columbia University Press, 1942). Five of these brief case histories are documented with roentgenograms and photographs of the spots.

The roentgenograms exhibit the shortening of the first metatarsal, a finding that is not always recognizable clinically because of the compensatory hypertrophy of the first cuneiform bone. The static troubles seem to be due not so much to the shortness of the first metatarsal as to its varus position. This position is evidenced on the roentgenogram by a wide separation between the first and second metatarsals which extends backwards through the first intermetatarsal space. In the young patient there was always a genu valgum also, which usually disappeared in the adult.

The author believes this anomaly has its origin in a form of neurofibromatosis of the skeleton (Thibierge type) as described in cases of congenital bowing and pseudarthrosis of the tibia, by Barber (*Surg. Gyn. Obst.*, 1939, 69: 618).

In the young patients the sex distribution of this anomaly was about equal. In the adult material there was a marked predominance of females. The author considers this predominance in the adult female to result from wearing high heels and tight, pointed-toe shoes which eventually result in diminution of the tonus of the muscles of the foot.

—John W. Brennan, M.D.

Bone Anomalies of the Tarsus in Relation to "Peroneal Spastic Flat Foot". E. A. JACK. *J. Bone Surg.*, 1954, 36-B: 530.

THE AUTHOR calls attention to the history of talocalcaneal bridge and calcaneonavicular bar, and their association with rigid flat foot. He presents 30 cases of his own, in 23 of which tarsal anomalies were present.

It has been stated that the sustentaculum and the calcaneum secundarium are responsible for the formation of these bars or bridges but the author believes that inasmuch as these anomalies vary so greatly in dimension and even in placement regardless of the presence of syndesmosis or synchondrosis, and that the placement of the cleft varies so greatly, it is unreasonable to suppose that the deformity is the result of accessory bones. He believes that the abnormality is the result of an error in differentiation of the mesenchyme which is destined to form the tarsus. This error may be responsible for a complete fusion at one extreme, or the presence of a small accessory bone at the other. He believes that the bone spur which forms on the dorsolateral portion of the head of the talus is not

diagnostic of a tarsal anomaly because it occurs in other conditions in which there has been long-standing valgus deformity. These spurs were rarely seen in the young patients but became more constant after the age of 16 and tended to increase in size with persistence of the symptoms. The most common age at which children began to complain was between the ages of 12 and 15 years when bone had replaced cartilage in the tarsus.

The author describes three categories of clinical signs and symptoms. First there were those patients who complained originally of an incident of acute pain and peroneal spasm, and most of these were treated by relief from weight-bearing, either in bed or in plaster for 4 to 6 weeks, followed by physiotherapy; the spasm and pain disappeared and they were able to carry on without disability, although they had some restriction of subtalar motion and some heel eversion. In the second category were those who complained of chronic persistent pain and stiffness, or who relapsed after an acute incident of spasm. These patients had a talocalcaneal bridge, and 11 of the 14 feet fell in this category. The third category comprised patients who had anomalies without symptoms. Only 1 patient with a talocalcaneal bridge came into this category. Eight patients having feet with calcaneonavicular bars were symptomless. Four of these were in bilateral cases in which only 1 foot was troublesome. The bar in the asymptomatic foot was of the narrow poorly developed type with a wide fissure.

True peroneal spasm, often accompanied by spasm of the extensor digitorum longus, was usually noted at some stage during the course of observation of each patient. Fixed shortened peroneal tendons occurred in the older patients as a result of chronic spasm. Eversion of the heel and limitation of subtalar motion were by far the two most common constant physical signs. While most of the patients responded to treatment with immobilization, rest, and physiotherapy, as well as shoe corrections, the author recognizes the need for arthrodesis when deformity is great or disability pronounced. In 5 cases of calcaneonavicular bar the deformity was corrected and a triple arthrodesis was performed through a lateral approach; however, in 4 cases of talocalcaneal bar the operation was simpler through the medial approach in which the deformity was corrected and the subtalar and talonavicular joints only were fused.

The author describes a case of talocalcaneal bar which was manipulated with great force under anesthesia, dislocating the talus from the tibiofibular mortise, but cautions against manipulation.

—Norman J. Rosenberg, M.D.

Soft-Tissue Tumors of the Sole; with Special Reference to Plantar Fibromatosis. RAYMOND A. ALLEN, LEWIS B. WOOLNER, and RALPH K. GHORMLEY. *J. Bone Surg.*, 1955, 37-A: 14.

ALTHOUGH DUPUYTREN, in his classic account of palmar fibromatosis, mentioned cases in which involvement of the plantar fascia was present, plantar fibromatosis has received scant attention in the 120 years which have since passed, as compared to that accorded this condition in the hand. Because the behavior of these lesions in the foot is poorly understood, the authors decided to review the records in the files of the Mayo Clinic, of all soft tissue tumors, both benign and malignant, involving the sole of the foot.

Sixty-nine cases of plantar fibromatosis and 9 cases of malignant neoplasms involving the soft tissues of the sole form the basis of this study. Of the 9 malignant neoplasms in this series, 8 were synoviomas and 1 was a liposarcoma. The behavior of these tumors in the foot does not differ from that of such tumors elsewhere in the body.

In 24 of the 69 cases of plantar fibromatosis in this series, the lesions involved the plantar fascia only; in the remaining 45 cases, both the palmar and plantar fasciae were involved. Peyronie's disease was found in 3 cases. Knuckle pads were present in 3 cases and keloids were associated in 4. Firm subcutaneous nodules in the ligamentous tissue elsewhere were noted in 2 cases.

The average age of onset of plantar fibromatosis was in the fourth decade of life. One-third of the patients were younger than 30 years at the time of onset; the lesion was congenital in 2 patients. There were 43 males and 26 females in this series of 69 cases of plantar fibromatosis. Following surgical excision in 38 cases of plantar fibromatosis, the lesion is known to have recurred in 25 cases, in most instances within one year after operation.

The course of plantar fibromatosis is apt to be long and only slowly progressive. In the great majority of cases the lesion is relatively asymptomatic. Pain is usually infrequent and mild. Fibromatosis may be mistaken histologically for a malignant neoplasm on the basis of actively proliferating fibroblasts, cellular variability, mitotic figures, and, on occasions—especially after previous surgical treatment—apparently invasive properties. The histologic features are diagnostic to the pathologist familiar with this lesion. Plantar fibromatosis is a benign lesion. There is no evidence that the lesion ever becomes malignant.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Wedge Arthrodesis of the Wrist. DAVID L. EVANS. *J. Bone Surg.*, 1955, 37-B: 126.

THIS METHOD of arthrodesis of the wrist was first advocated by Mr. E. P. Brockman to obtain solid arthrodesis of that joint in the presence of a flexion deformity. At first this procedure was used for Volkman's ischemic contracture, but of late it has been used satisfactorily for conditions other than flexion deformity. The technique consists of sharpening the radius so that it resembles a wedge, and driving this wedge solidly into the carpus, after the carpus has been opened along its transverse axis like the lips of an oyster. Resection of the distal 1 inch of the ulna may or may not be done concomitantly. This type of arthrodesis eliminates the need for the taking of bone from elsewhere for grafting.

Eighteen patients, among whom 19 wrists were treated by this form of arthrodesis, are included in the author's report. Ages ranged from 8 to 55 years, and the follow-up period varied up to 18 years. In 12 cases deformity of the wrist was the main problem; in 6 cases

loss of function was the main problem. Sound fusion was obtained for all patients, and when queried, all expressed satisfaction with the result.

In analyzing the late changes roentgenologically, it was noted that fusion had occurred between the radius and the proximal carpal row only in some cases. Clinically, this sort of result was indistinguishable from the result in others in which fusion to both rows had taken place. The author cautions against the use of this method of arthrodesis before full growth has occurred.

—E. W. Johnson, Jr., M.D.

The Primary Repair of Traumatic Digital Skeletal Losses by Phalangeal Recession. CARL E. NEMETHI. *J. Bone Surg.*, 1955, 37-A: 78.

THE AUTHOR discusses 5 cases of finger trauma. These were cases in which amputation might be considered. Instead, the terminal phalanx was saved by shortening the finger. Usually the joint is resected and the phalanges are arthrodesed in flexion in a position of function. Intramedullary wires are usually used for internal fixation, and a volar plaster splint is used for 6 to 8 weeks. The operation is dependent upon an intact artery and nerve, or a reparable nerve.

The author concludes that a shorter finger, even with limited interphalangeal motion, is much better than an amputation. This is certainly true even if the sensation is not entirely normal.

—D. Keith McElroy, M.D.

Rotary Angulatory Osteotomy of the Metacarpal Bones in Mutilated Hands. LARS ÖNNE. *Acta chir. scand.*, 1954, 108: 268.

THE AUTHOR describes 7 cases of various types of mutilated hands, all of which presented the problem of inability to grasp. In addition, several of the patients had some loss of sensation which complicated the problem. There were 4 patients with a total or subtotal loss of four fingers so that the grip between the remaining stumps and the intact thumb was impossible. There were 2 cases in which the little finger and the little and ring fingers, respectively, were intact, and 2.5 cm. and 1 cm., respectively, of the basal phalanx of the thumb were intact. In both cases osteotomy was performed along with deepening of the thumb cleft by resection of the second metacarpal and the distal half of the third metacarpal. There was 1 case in which the thumb was intact but the distal phalanx of the little finger was lacking. Prior to operation none of the patients could make contact between the thumb or its remnants and the ulnar portion of the hand or the ulnar fingers; the least width between these areas varied from 0.5 to 4 cm.

Postoperatively these parts could be approximated with comparative ease in all cases. In 5 of the 7 cases the results were considered good and the patients were extremely grateful that they could grasp objects and handle light tools. In 1 case in which it was necessary to perform an arthrodesis of the first metacarpal joint in flexion, the improvement was somewhat less than hoped for because approximation of the thumb to the stump of the little finger could only be accomplished with difficulty. One patient considered that he had no improvement from his operation, but the author attributes this to the lack of sensation which was present.

The simple surgical procedure of rotational angulatory osteotomy of the fifth and sometimes fourth metacarpals is described with roentgenograms and preoperative and postoperative photographs of some of the patients.

—Norman J. Rosenberg, M.D.

The Management of the Tuberculous Hip Joint. WALTER MERCER. *J. Bone Surg.*, 1954, 36-A: 1123.

THE AUTHOR predicted that antibiotics will shorten not only the course of the disease but also the time period of immobilization with its unfortunate effects such as renal calculi, osteoporosis, and premature epiphyseal closure, leading to a short extremity.

Bony ankylosis of a tuberculous hip joint (particularly in the advanced intraosseous type of lesion) is the method of choice because of its long proved efficacy. The author suggests that early diagnosis of the lesion of the hip joint is essential if the patient is to be left with a functioning and mobile hip. Every effort should be made to cause sinuses to heal and to prevent secondary infection. This can usually be achieved by using antibiotics locally and generally. Even long-standing sinuses will heal in a few months although surgery may be needed if the walls of the sinus tract are very thick or if there is an associated sequestrum of bone.

A further consideration is the presence of a tuberculous abscess. This should be removed as soon as possible, usually by aspiration. This may not, however, be possible, and it may be necessary to drain the abscess by incision. Just as in the treatment of acute osteomyelitis, it is the tension in the bone rather than the infection that causes thrombosis of the vessels and the formation of a sequestrum; so, in tuberculosis, pus under tension causes delay in healing, if not spread of the infection.

It is recognized that there are still some cases in which, although the lesion is intra-articular, most of the articular cartilage is still intact. Pencillin and streptomycin powder are used locally. It is necessary to immobilize the joint in plaster for a few weeks (in the case of femoral foci) or by fairly heavy traction (in the case of acetabular foci). A certain proportion of hips will heal by fusion or may require arthrodesis later, but it is remarkable how many will have mobility at the end of treatment.

In cases of synovial disease, with a tense full joint and with the synovial membrane and capsule ballooned out because of an effusion, there is every prospect of obtaining a mobile joint if the streptomycin and other drugs can reach it in sufficient concentration and if, of course, the joint surfaces are undamaged. The tuberculous exudate does not contain proteolytic enzymes, such as those seen in the exudate of pyogenic infection; the cartilage tends, therefore, to persist until a later stage when it is covered by the tuberculous pannus of unhealthy granulation tissue. Early diagnosis and decompression are essential in order to save the joint, and, therefore, biopsy is justified, apart from diagnosis, to relieve tension and to allow the penetration of the chemotherapeutic agent. It is essential to remove as much of the diseased synovial membrane as possible, together with part of the capsule.

When the tuberculous focus is extra-articular, it is much safer to excise this focus than it was in the days before streptomycin. After antibiotics have been ad-

ministered the excision is carried out. It is a good practice to fill the cavity, after a thorough removal of all diseased bone, with cancellous bone chips and to use streptomycin and penicillin powder locally.

The author recognizes the difficulty of early diagnosis. In the later stages when there is bone atrophy, a biopsy of the deep inguinal glands is carried out; from the point of view of diagnosis, this is more important than an arthrotomy, since the bacilli are filtered to the glands and are more likely to be found.

The changing trend in the type of infection is noted. Bovine infection used to be four to five times more common in skeletal tuberculosis than the human type, but a reversal of this has now taken place and in a recent investigation of 950 patients, 26.3 per cent had bovine tuberculosis and 73.7 per cent had human tuberculosis.

The following combinations of drugs are advocated:

1. Streptomycin sulfate, 1 gm. daily, with sodium para-aminosalicylate, 5 gm. four times a day. In the United States the drug is usually expressed in terms of the acid, whereas in Great Britain it is usually expressed in terms of sodium para-aminosalicylate; the 20 gm. dose of sodium para-aminosalicylate suggested corresponds roughly to about 15 gm. of para-aminosalicylic acid. This difference in the expression of dosage has caused a great deal of confusion.

2. Streptomycin sulfate, 1 gm. daily, combined with isoniazid, 100 mgm. twice a day.

3. Isoniazid, 100 mgm. twice a day, combined with sodium para-aminosalicylate, 5 gm. 4 times a day.

—C. Fred Goeringer, M.D.

Arthroplasty of the Hip; a Review of 110 Cup and Replacement Arthroplasties. M. B. DEVAS. *J. Bone Surg.*, 1954, 36-B: 561.

THE AUTHOR reviews a total of 110 cup and replacement arthroplasties, of which 63 were cup arthroplasties and 47 were Judet prostheses. Fifty of the cup arthroplasties were considered successful while 24 of the Judet prostheses were considered successful.

In the series with cup arthroplasty, it was found that 3 were unsatisfactory because of dislocation, 11 were unsatisfactory because of pain, 2 patients died, and there was insufficient information in 4 cases.

In the series with Judet prosthesis, 8 were unsuccessful because of a fractured prosthesis. There was 1 case of dislocation, 14 prostheses were unsatisfactory because of pain, there was 1 death, and insufficient information was obtained in 2 cases.

Among the successful cup arthroplasties 3 were successful only after revision with a cup. Two became satisfactory following revision with an acrylic prosthesis. Two patients had successful arthrodeses. Three arthrodeses were unsatisfactory after revision with an acrylic prosthesis, and there was 1 death after revision with a cup.

Two prostheses became satisfactory after revision with a prosthesis; in an additional case it was necessary to provide a special prosthesis; three other cases remained unsatisfactory after revision with an acrylic prosthesis, and in 3 cases it was necessary to excise the femoral neck.

It is evident that in this series the outcome of cup arthroplasties was much more favorable than that of acrylic prostheses. The author believes that this can be explained, but not excused, by breakage of the acrylic prosthesis. *—Norman J. Rosenberg, M.D.*

A Review of 650 Hip Arthroplasty Operations. MARGARET M. SHEPHERD. *J. Bone Surg.*, 1954, 36-B: 567.

THE AUTHOR reviews the operations performed on 649 hips in seven different centers. The postoperative periods ranged from 6 months to 6 years, with a few somewhat longer. The operations included both cup arthroplasties and Judet arthroplasties. The results are tabulated with regard to the original diagnosis and whether or not one or both hips were involved or operated upon. The results are also correlated with relation to the degree of mobility, but in all of the foregoing categories no distinction is made between the Judet arthroplasties and the cup arthroplasties. The results with regard to the sex of the patient in cases of osteoarthritis showed that males have slightly better results than female patients. In osteoarthritis good results were somewhat more common in the younger patients, and poor results more common in older patients. Patients with flexion deformity of something less than 20 degrees were likely to have better results than those patients with no flexion deformity.

The cup arthroplasties performed were compared as to whether an anterior or posterior incision had been made, but this was not significant because most of the posterior incisions were performed in cases in which the trochanter was transplanted. When the trochanter was not transplanted in cup arthroplasties the results up to 1 year were better, but after 1 year and for as long as 5 years the percentage of excellent and good results was somewhat higher when the trochanter was transplanted downward; however, in this group there were also a greater number of poor results.

Five hundred and twenty-six cases of cup arthroplasty were compared with 112 cases of Judet arthroplasties with respect to the results in terms of intervals since the operation. The cup arthroplasties seemed to be at their best after 1 year and up to 4 years after operation, but after this the poor results increased to 52 per cent, and beyond 5 years, to 54 per cent. The results of Judet arthroplasties were generally good up to 2 years, and in a period of from 6 months to 1 year after operation they were better than those of the cup arthroplasty, but in 2 to 3 years there was an increase in the poor results, which rose to 38 per cent; and 79 Judet arthroplasties showed that 24 to 30 months after operation the results were better than those at 30 to 36 months after operation, which suggested that increasing deterioration was likely with the passage of time.

This is a most excellent and involved statistical study which deserves careful reading rather than abstracting. *—Norman J. Rosenberg, M.D.*

Results of 82 Osteoplastic Shelf Operations on the Hip (Résultats de 82 butées ostéoplastiques de hanche). P. PADOVANI. *Acta orthop. belg.*, 1954, 20: 554.

THE AUTHOR reviews the results of 82 osteoplastic shelf operations for congenital subluxation of the hip in patients of varying ages ranging from adolescence to 50 years. Three patients were more than 50 years

of age. The author's studies were made from several viewpoints.

In 12 patients under 20 years of age good results were obtained in 100 per cent; in 13 patients between 20 and 30 years of age good results were obtained in 84.7 per cent; in 30 patients between 30 and 40 years of age good results were obtained in 80 per cent; in 17 patients between 40 and 50 years of age good results were obtained in 59 per cent; and in 3 patients over 50 years of age the results were poor.

Follow-up. There was no noticeable difference after 1, 5, 10, or 15 years, good results being found in approximately 75 per cent of the cases. The small number of cases followed up for more than 15 years does not allow accurate conclusions to be made.

Etiology. The primary subluxations gave the highest percentage of good results, whereas residual subluxations treated after attempts at reduction had a definitely poorer prognosis. It appears that preoperative osteoarthritis does not interfere substantially with the final result of the shelf operation. Osteoarthritis was present in 33 of the 82 cases reviewed and the percentage of good results in the osteoarthritic group was 54.5 per cent. One may assert that the shelf operation prevents secondary osteoarthritis in a great number of cases.

The author believes that in the adult this procedure should always be considered and that the osteotomy (Pauwels) should be reserved for cases with predominant coxa valga and with an adequate acetabular brim. He also believes the shelf operation is far superior to arthroplasty done as a routine procedure in similar cases. —*Fernando Aleu, M.D.*

Syme's Amputation. J. H. SHELSWELL. *Lancet*, Lond., 1954, 2: 1296.

NONE OF THE PATIENTS who had suffered Syme's amputation for peripheral nerve injury retained the long stump for more than 3 years. This was because the skin flaps had to be modified to exclude areas in which either the sensibility was abnormal or neuropathic ulceration was present and sepsis supervened.

Of the 305 amputations, 28 were immediate failures in that reamputation was necessary within less than a year. The causes of immediate failure were vascular insufficiency, sepsis, peripheral vascular disease, peripheral nerve injury, technically poor amputation, painful neuromas, radiotherapy, and ankylosis of the knee.

In his original paper (1843) Syme emphasized the importance of avoiding division of the posterotibial artery above its bifurcation; this was said to prevent ischemic necrosis of the medial side of the heel flap. Only one instance of this complication was found in the present series.

Bursitis and callosity formation were responsible for the conversion to the long type of limb in several cases, but it was sometimes caused by the patient's failure to maintain the artificial limb in good condition.

In the remaining 201 Syme's amputations there had never been any trouble attributable to the stumps. It was decided to examine a representative number of such cases and to compare them with a similar number of below the knee amputations.

Sixty-six patients who lived near the London center were evaluated and it was found that 64 were capable of prolonged physical effort. Several could walk long distances, and a few could play games such as tennis.

Two patients were so grossly incapacitated by other disabilities that they could no longer walk more than a few yards: one had contracted poliomyelitis soon after the amputation and had been unable to walk more than 50 yards since, and the other had serious cardiac disease.

Thirty-three patients could run in an emergency, but their progression was really a hop, skip, and jump. Twenty-one were sufficiently agile to play tennis, and 2 played amateur football.

Fifty-one patients could stand all day at work without undue discomfort, although 10 complained of pain after 4 hours of standing, and 5 after 2 hours. This did not prevent their doing sedentary jobs, and they did not lose long periods of work through disability in the limb. Sixteen were engaged in work such as farming, iron molding, and steel scaffold erection.

The good Syme's amputation stump tolerates as much exercise as a good below the knee stump, but in addition it allows the patient to walk on the bare stump. Many patients walked about the house without the prosthesis and suffered no discomfort. The patient who was followed up for 74 years after amputation still walks in her garden without the artificial limb. All the patients were asked their opinion regarding the amputation and most of them were enthusiastic in its favor. All the women disapproved of the artificial limb because it was bulky around the ankle and impossible to conceal. Since the artificial limb for below the knee amputation can be matched so well with the normal leg, it is doubtful whether a Syme's amputation should ever be done in the female patient. It appears to be ideal for a man employed in heavy labor.

The conclusion is that the Syme's amputee can do anything of which the below the knee amputee is capable, and has certain benefits which the latter does not possess. A poor below the knee stump is a much more difficult problem than a poor Syme's stump.

—*C. Fred Goeringer, M.D.*

Surgical Treatment of Solitary Bone Cysts and Giant Cell Tumors (Zur operativen Behandlung der jugendlichen Knochencysten und Riesenzellgeschwuelste). H. KINDLER. *Chirurg*, 1955, 26: 17.

THE AUTHOR reviews the cases of 51 patients who were treated during past 15 years at the University Clinic, in Freiburg. He stresses the importance of local radical excision of solitary bone cysts or giant cell tumors until healthy bone is encountered, after which an autogenous bone graft taken from the tibia, fibula, or ilium is implanted. In the lower extremities where muscle pull is strong and static function is important, a cortical tibial or fibular graft has been used. In filling the defect with cancellous, nonweight-bearing bone, bone chips taken from the ilium were satisfactory. In cases in which simple impaction of the grafts did not give satisfactory stability, screws or circular wires were used, and were removed after healing occurred.

In the author's opinion many unsatisfactory results can be attributed to insufficient removal of the pathologic tissue and the improper selection of a graft for the location. Three case histories of patients with bone cysts are presented, one of which was that of a 5 year old girl with a large multilocular cyst in the proximal end of the humerus. Since the epiphysis was destroyed it had to be removed completely and replaced by the proximal end of the fibula. The 12 year follow-up showed some shortening of the extremity, but a very satisfactory functional result.

—George Wichman, M.D.

Further Experiences with the Phemister Bone Grafting Procedure (Weitere Erfahrungen mit der Phemister-Plastik). A. M. FEHR and W. RIEBEN. *Helvet. chir. acta*, 1954, 21: 411.

SINCE the publication, in 1947, of Phemister's article entitled '*Treatment of Ununited Fractures by Onlay Bone Grafts Without Screw or Tie Fixation and Without Breaking Down of Fibrous Union*' the initial distrust in this procedure has disappeared. The author reports 40 cases in which good union resulted. The period required for complete consolidation varies between 10 weeks and 12 months, with an average of 3 to 5 months in instances of delayed union and of 6 to 7 months in nonunion. Phemister reported faster consolidation with an average period of 2 to 3 months.

In the series analyzed, 15 dual grafts were employed, and faster assimilation with thinner grafts was observed. Additional spongeous bone chips did not appear to hasten the healing process, and osteotomy of the fibula evidently had no influence on the rate of healing.

According to Phemister, the graft stimulates ossification and the most important stimulus comes from the periosteum detached for the graft bed and from the bone fragments proper. Nonpreserved autogenous grafts give better results. The consolidation comes from the periosteal-endosteal callus and in some cases the graft becomes absorbed first with secondary periendosteal invasion. The graft must be in complete firm contact to avoid delay or partial osteolysis. In the authors' opinion, grafts from the bone bank give the same good results, except in instances of pseudarthrosis with a larger defect. The procedure has been employed also in 6 cases of recent and difficult fractures of the tibia and forearm, but as yet the results cannot be ascertained. As combinations, screw fixations and intramedullary nailings together with onlay grafts are suggested. *—Ernest H. Bettman, M.D.*

FRACTURES AND DISLOCATIONS

The Types of Fracture of the Navicular Bone of the Hand (Die Bruchformen des Kahnbeins der Hand). E. TROJAN. *Wien. med. Wschr.*, 1954, 104: 1024.

OF THE 1,113 patients with fractures of the navicular bone of the hand who were admitted to the service headed by Boehler in Vienna, Austria, in the period from 1926 to 1952, the author selects the 734 fresh fractures of the scaphoid to evaluate the results of treatment.

The patients are divided roughly into three groups: those with the so-called horizontal oblique fractures, those with transverse fractures, and those with vertical oblique fractures.

In the horizontal oblique fracture (47.02 per cent of the cases discussed) the fracture line courses radialward and distalward; its direction is oblique to the long axis of the navicular bone but vertical to the longitudinal forearm-hand axis. In its healing capacities, this direction of the fracture line is compared with the type I fracture line of the femoral neck. As in this fracture, the forces pressing the fracture surfaces together predominate over the shearing forces and those causing a tipping over of the fragments. Even when the break occurs in the middle third of the bone consolidation is usually complete after 6 weeks, at most after 10 to 12 weeks. Since in this form the movements of the fingers seem to aid the pressure effect it is best not to hinder them (avoidance of inclusion of the thumb in the cast).

In the transverse fractures (49.85 per cent of the cases in this group) the fracture line extends transversely through the navicular bone, vertical to its long axis and obliquely to the longitudinal forearm-hand axis. This direction of the fracture line is compared with the type II fracture line of the femoral neck. In the healing of this type of fracture the shearing and the tipping forces are more prominent and the time required for complete consolidation is apt to be prolonged (more than 10 to 12 weeks).

The vertical oblique fracture of the scaphoid is relatively rare (3.13 per cent). The fracture line courses obliquely across the long axis of the navicular bone and on the anteroposterior roentgenogram appears to parallel the longitudinal forearm-hand axis. The direction of the fracture line is compared with that of the type III fracture line of the femoral neck; both shearing and tipping forces are present, healing is apt to be prolonged and pseudarthrosis is always a possibility. The diagnosis may present difficulty, particularly in instances in which the fracture line runs exactly parallel with the long axes of the radius and the ulna. The break can be recognized only in the lateral projection or (in 60 to 80 per cent of the cases) when the wrist is strongly supinated. This type of fracture frequently arises as the result of force applied in the direction of the long axis of the thumb; the peripheral portion of the navicular undergoes a shearing against the proximal portion.

The unfavorable prognosis in the last type of navicular fracture is illustrated by two facts: this group included the only instance in which resort to the Matti operation was necessary, and also included the highest percentage of pseudarthroses. Of 20 such fractures, 3 (15 per cent) did not go on to firm consolidation; of the remaining 556 patients who could be traced, only 16 (2.9 per cent) developed pseudarthroses.

—John W. Brennan, M.D.

Experimental Studies of Intervertebral Disc Lesions; Repair of Experimental Intervertebral Disc Injuries. (Text in Japanese; summary in English.) TAKU HAYASHI. *Arch. jap. chir.*, 1954, 23: 632.

IN AN EXPERIMENTAL STUDY in the Orthopedic Division of the Medical School of the University of Kyoto, the intervertebral discs of 34 rabbits were punctured or incised to different depths. The approach was from

the anterior direction and the defects were produced in the anterior tissues of the disc. Following the operative procedure the animals were observed for periods of from 4 days to 20 months.

In the first group of injuries the cut involved only the fibers of the anterior longitudinal ligament and the superficial layers of the annulus fibrosis; in the next group the cut passed through the annulus to a point near the nucleus pulposus; in the most severe injury produced, the nucleus was entered and its herniation effected (schema shown in the original text). Following partial recovery from the operation, some of the animals were maintained in a forced upright posture by incarceration in a cylindrical, cagelike upright can (illustrated in the original text) while others were allowed to run about on all fours.

In the instances in which the incision was only superficial, the wound healed at an early period by proliferation of connective tissue and of cartilage cells. Where the deeper layers of the annulus fibrosus were incised the defect persisted, and even after a period of 20 months there was no evidence of an attempt on the part of the surrounding tissues to close the breach. In the injuries to the nucleus pulposus, this structure was gradually replaced by fibrous and fibrocartilaginous tissues.

In some of these rabbits there developed a firm proliferation from the anterior margins of the vertebral bodies. When this was removed it was found to be composed entirely of hyaline cartilage. After two months this mass was found to have reformed and to be just the same as it was before. In an animal in which an adjacent intervertebral disc was injured the reformation of the marginal proliferation developed at a more rapid rate. This was considered to be an instance of the so-called distant effect of Lob.

In the animals which were kept in a forced upright posture, even in those in which the disc had not been incised (control animals), small lacerations were observed within the tissues of the annulus fibrosus and there was a certain amount of disarrangement of its fibers. In 4 of 9 rabbits which were maintained in a forced upright posture there developed a protrusion of the posterior wall of the disc, in spite of the anterior approach and anteriorly placed injury. This rarely occurred in the other animals. The protrusion was at times so marked as to exert pressure on the dura and spinal cord and eventually led to the formation of adhesions. The herniation posteriorly was very similar to that on the anterior surface of the vertebral column; posteriorly the marginal lipping was slight, and no evidence of proliferation of hyaline cartilage was observed.

Despite the frequently severe changes within the injured disc itself, there was little tendency for the adjacent vertebral bodies to become fused with one another. Only in one animal, with infection, did a certain amount of fusion develop between these two structures. Even here vestiges of the degenerated disc persisted for a considerable period of time.

Although it is admittedly not advisable to apply the findings of experimental research directly to the intervertebral injuries of the human, the author believes that the present experimental study does not suggest any need for an excessively prudent attitude with reference to the operative treatment of discal hernia. There seemed to be no evidence—at least in the rabbit—that such posterior lipping (marginal osteophytes) would develop after intervertebral disc injuries as to exert damaging pressure on the contents of the spinal canal or on the nerve roots. The author believes that in those instances in which a hernia of the nucleus pulposus in the human is clearly diagnosed, the indication for its surgical removal is present.

—*John W. Brennan, M.D.*

Improper Healing of Fractures of the Extremities; Etiology and Treatment (Text in Bulgarian; Summary in Russian). E. PANEVA-XOLEVICH. *Chirurgia.* Sofia, 1954, 7: 154.

THIS IS A PLEA for the better treatment of fractures in Bulgaria. Following the textual and documentational presentation of material originating in the clinic of Boychev, whose stature as an orthopedic surgeon has been repeatedly noted in this journal (Surg. Gyn. Obst.; Internat. Abstr. Surg., 1938, 67: 287; 1952, 95: 78; 1953, 96: 389), the author discusses the poor results obtained by the so-called non-medical practitioners and other institutions and physicians of Bulgaria, and the excellent results obtained in instances of malunion and nonunion (pseudarthrosis) of fractures of the extremities by modern methods of orthopedic procedure.

The following suggestions for lowering the incidence of these poor results are offered. It is proposed that:

1. The local doctors institute an educational campaign, aimed at winning them away from seeking the assistance in fracture cases of their accustomed bonesetters, a practice which is asserted to produce only harm to the patient in the majority of instances.

2. In those instances in which the local physician does not have at his disposal the proper appliances for making an exact diagnosis and for giving the patient the best treatment possible, he should at once refer the patient to the central provincial hospital.

3. In cases of fresh fractures, the patient be given a thorough roentgenographic study before any attempt at manipulative correction is attempted; and that the patient be re-examined 7 or 8 days later, when there may be detected any displacement of the fragments as a result of muscle pull. When it is found that the correction is not maintained, the patient should at once be turned over to the medical traumatologist. This is no time for self-complacency; in times past too many patients have been sacrificed to this attitude; the authority of the traumatologist rests on the fact that he is concerned only with the proper and timely treatment of the patient.

4. More courses be instituted for the training of medical traumatologists and that they be encouraged to consult with their colleagues who are orthopedic specialists. The orthopedic specialists should be encouraged to supervise the work of their nonorthopedic traumatologic colleagues and to feel a responsibility in preventing them from making mistakes. In the provincial hospitals it is imperative to proceed at once to the standardization of the operative methods for the treatment of recent fractures.

5. In those fractures which have healed improperly, the patient be sent to the clinic of the orthopedic

traumatologist for corrective procedures at the earliest possible moment. Since the author believes that most of the cases of malunion are the result of industrial accidents and that treatment is frequently avoided in order to obtain more compensation for invalidity, he proposes that the commission on pension awards employ a medical traumatologist who could give a competent opinion as to what may be expected from corrective procedures, and who would refer the patient for such treatment.

6. The central hospitals establish departments for orthopedic traumatology with sufficient modern equipment, and that these departments be entrusted to properly trained specialists in traumatology.

—John W. Brennan, M.D.

Surgical Treatment of Nonunion and Delayed Union of Long Bones. O. Biström. *Acta orthop. scand.*, 1954, 24: 160.

The rising number of cases of nonunion at the present time, following increased traffic and industrial accidents, is still caused by inadequate traction, too brief a period of immobilization, and the more frequent use of metal osteosynthesis. From 4 to 6 months must pass before the diagnosis of a nonunion can be made, but the strict differentiation between pseudarthrosis and delayed union still remains an unsolved problem.

Kirschner's splintering and Beck's drilling methods have rendered poor results. The wiring and intramedullary fixations are not always satisfactory; the Phemister bone onlay graft combined with screw fixation seems to offer the best results.

The author operated on 38 cases (22 tibial, 9 femur, 4 humerus, 7 forearms, 1 basal thumb phalanx). The surroundings of the graft were usually packed with spongy bone from the iliac crest. For nonunion of the femur tibial grafts were used with vitallium screw fixation, and in humeral fractures the grafting was combined with intramedullary nailing. In no case was the false joint removed. *—Ernest H. Bettmann, M.D.*

The Early Treatment of Congenital Dislocations of the Hip and Its Results (Die Fruehbehandlung der angeborenen Hueftluxation und ihre Ergebnisse). H. Schoberth. *Zschr. Orthop.*, 1955, 85: 517.

Murch Jensen stated that the response of the tissues to treatment is proportional to its intensity of growth. In reviewing some of the dislocations of the hip treated at the clinic, it was found that even minor degrees of congenital dislocation of the hip often ultimately revealed severe changes in the head and neck of the femur. This finding was thought at one time to contraindicate early treatment of congenital dislocations. Lorenz, Becker, and Hilgereiner suggested that the earlier treatment is started, the greater the danger of subsequent deformity of the femoral head.

The author reviewed the cases of 300 patients with 559 congenital dislocated hips, 100 of which were treated the first year, another 100 at the second year, and the third 100 at the third year of age. Disregarding the subluxations of the hip, the following method was used in the treatment of congenital dislocations.

The patient was anesthetized with avertin and ether anesthesia, a manual reduction was accomplished, and a cast was applied in the Lorenz position. The cast was changed in 8 weeks and the leg was brought into abduction and internal rotation in order to reach Lange's first position. At the same time a posterior plaster shell was made with the patient in the recumbent position. The cast was left on for an additional 2 months. At the end of 6 months the patient was allowed to lie in the posterior plaster shell for 1 to 2 hours daily in order to allow the child to move the right hip actively. Children who were treated in the Hilgereiner splint were also allowed to lie in the posterior plaster shell and move the hip actively at the end of 6 months. Weight-bearing was allowed at the end of one year.

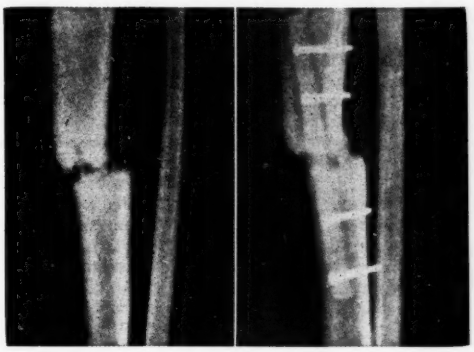

Fig. 1 (Biström). Tibial pseudarthrosis before and after grafting of cortical bone with vitallium screws followed by intense new bone formation in the connective tissue of the nonremoved pseudarthrosis.

Of 559 dislocated hips, 203 were found to have subluxations. There were frank dislocations in 356 hips. Four years after reduction, the following results were observed: excellent results in 45.3 per cent of the subluxations and in 9 per cent of the dislocations. A good functional result was obtained in 33 per cent of the subluxations and in 20.5 per cent of the dislocations; malposition of the head with flattening of the acetabulum and changes in the head and neck of the femur were observed in 21.7 per cent of the subluxations and in 66.3 per cent of the dislocations. Redislocations of the hips occurred only in the dislocated hips, and in only 4.2 per cent of these.

Schede differentiates 2 groups of dislocations: (1) true congenital dislocations which usually are associated with additional malformation, and (2) dysplasia with flattening of the acetabulum which usually causes complete dislocation of the hip at the end of one year. There were only a few cases in group 1; the majority belonged in group 2. Dysplasia of the acetabulum was most successfully corrected in the first year of life. Lange also found that deformities of the head and neck of the femur are rare if the child is treated in the first year. Schmorl recorded the observation that in certain cases no aseptic necrosis of the head of the femur occurred even though all the vessels in the capsule were severed. He concluded that on occasion the circulation in the ligamentum teres is sufficient to maintain satisfactory circulation

in the femoral head. The Lorenz position causes an obliteration of the blood vessels within the synovial capsule. In many cases in which the vessels in the ligamentum teres appeared to be obliterated, changes similar to osteochondritis of the femoral head were found in a large percentage of cases.

Becker suggested that a spasm of the adductor muscles causes osteochondritic changes in the femoral head. The x-ray findings are similar to those of Legg-Perthe's disease. It is therefore concluded that in the early treatment in congenital dislocations of the hips it is very important that subluxations be treated by means of a splint and that true dislocations be treated by the afore-mentioned method.

—George I. Reiss, M.D.

ORTHOPEDICS IN GENERAL

Muscular Factors in Post-Traumatic Stiffness; Notes on Experimental Physiopathology (I fattori muscolari della rigidita post-traumatica; note di fisio-patologia sperimentale). DANTE COSTANZO. *Ortop. traumat. app. motore*, 1954, 22: 401.

THIRTY-ONE RABBITS were studied by the author. Twelve of these animals were used as controls; the controls were subdivided into three groups of 4 rabbits each.

In the first group the right hind leg was simply immobilized in a cast in the position of flexion; in the second group the right hind leg was immobilized in full extension; and in the last group of control animals the femur of the right hind leg was fractured and osteosynthesized with the T-shaped plate of Marino-Zuco, without the use of a cast.

In all of these animals any stiffness from nonuse was quickly overcome; the knee joints immobilized in extension required a noticeably longer time than the others to regain complete joint function.

In the remaining 19 animals fractures of the femur of the right hind leg were produced as previously described; in 6 of these osteosynthesis was performed and the limb was then placed in a cast; in the remaining 13 animals the limb was simply immobilized in a cast. In the last group of 13 rabbits, good reduction was obtained in 5 and poor reduction in 8. These groups were then considered separately in evaluating the results.

In order to study the strength of the adhesions between the femur and the muscles controlling the knee joint, an ergometric device was constructed and the amount of force required to tear loose these adhesions was measured in kilograms. It was found that for the group with fracture which was treated by osteosynthesis but without a cast, the pull required to loosen the osteomuscular adhesions averaged something over 5 kgm.; for the group of fractured femurs with a cast but without osteosynthesis, the pull required for the limbs with good reduction was 16 kgm., for the limbs with poor reduction 22 kgm. For the group treated with both osteosynthesis and a cast the pull required averaged 17 kgm. These results alone, in the author's opinion, show the importance of the participation of the muscle tissue in the causation of joint stiffness following trauma in these instances.

In studying the nature of the muscle participation in the causation of joint stiffness following trauma, sections of the injured region were made and stained with a frozen section technique. Various staining methods were used (Hale, Fuelgen, Mallory). It was found that the stiffness resulted indirectly from the formation of adhesions, but also from waxy degeneration, atrophic and proliferative changes in the muscle tissue itself. These degenerative changes are of vascular and nervous origin. Most important are the vascular changes, which are ascribed by the author to tight application of the cast and the failure to note the signs of tissue injury. The end result of this injury is a connective tissue substitutive process on the part of the perimysium.

The author hopes to apply these findings in the treatment of clinical cases in the human as the occasion presents itself. *—John W. Brennan, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

An Attempt at Treatment of Acute Arterial Occlusions of the Extremities with Fibrinolytic Enzymes (Tentativi di terapia con enzimi fibrinolitici nelle occlusioni arteriose acute delle estremita) A. Rodolico, P. Bazan, and M. Florena. *Ann. ital. chir.*, 1954, 31: 715.

This study was undertaken in order to determine if fibrinolytic enzymes could be used in the treatment of acute arterial occlusions of the extremities. The authors review the etiology, pathologic physiology, and treatment of these conditions. Particular attention is given to past attempts at treating arterial occlusions by increasing the fibrinolytic activity of plasma by anaphylactic shock (Sabatini and Meneghini; Nolf). They describe the development of fibrinolytic enzymes, their current clinical applications, their use in the treatment of experimental venous thrombosis (Guggiano, Mairano, and Pasquero) and of experimental pulmonary embolism (Shingleton, Anlyan, and Neill).

Two types of experiments were conducted.

First, in order to evaluate the toxicity of trypsin administered intravenously, 8 normal healthy rabbits, averaging 2 kgm. each, received 30 mgm. per kgm. of liophylized trypsin daily in the marginal vein of the ear. The total daily amount was given in 2 doses. The animals were divided into two groups. The first group was sacrificed after 8 days of treatment. During the course of treatment they appeared to be in normal health. Gross examination of the various viscera did not reveal anything abnormal and the liver and kidneys were normal upon microscopic examination except for a few degenerating cells in the lumina of the kidney tubules. The animals of the second group, sacrificed on the fifteenth day of treatment, also appeared to be in good health. On gross examination of the viscera nothing was found, but microscopically the liver showed some increase in the number of Kupfer cells, and there were desquamated cells in the tubules of the kidney in greater number than in the animals sacrificed on the eighth day.

In a second type of experiment trypsin was used to treat emboli produced experimentally in 15 dogs in the following fashion. Blood was withdrawn from the animal and placed in a sterile tube measuring 4 mm. in diameter. With a sterile technique, a 2 cm. length of coagulum was introduced into the femoral artery. Uroselectan arteriograms were taken before the experiment, again 3 hours afterward, and on the third day following the experiment. The site of occlusion was located in the femoral artery in 8 dogs, in the posterior tibial artery in 3, and in the anterior tibial artery in 3. Five animals served as controls.

In the remaining 10 dogs treatment was commenced in 3 or 4 hours, after the clinical signs of occlusion had appeared. The treatment consisted in injecting 15 mgm. per kgm. of trypsin in the artery above the occlusion on the day of the experiment and again on the two following days. In 7 of the treated dogs there was complete recanalization of the occluded vessel as shown by the arteriograms taken on the third day. In one animal there was only partial recanalization and in 2 animals the occlusion persisted. In all of the animals in the control group the obstruction remained unchanged. The authors relied solely upon arteriography for the evaluation of their results.

The good results that were obtained are attributed to early treatment, before organization of the clot, and to local intra-arterial administration which allows a high concentration of trypsin to reach the lesion.

It is stated that the toxic manifestations are not alarming since those seen in rabbits occurred only after prolonged administration of doses far greater than those used clinically. Furthermore, prolonged administration is unnecessary since the action of trypsin is rapid.

The authors conclude that the intra-arterial injection of trypsin can be useful in the treatment of acute arterial occlusion of the extremities.

—*René B. Menguy, M.D.*

Arteriovenous Anastomosis in the Treatment of Gangrene of the Extremities Due to Arterial Occlusion (L'anastomosi arterio-venosa nel trattamento delle gangrene degli arti per obliterazione arteriosa). Giorgio Pozzi. *Ann. ital. chir.*, 1954, 31: 640.

Three questions have been raised concerning the feasibility of an arteriovenous anastomosis: (1) will the anastomosis remain patent; (2) can the arterial current overcome the resistance of the venous valves; (3) can the arterial blood reach the capillary network and be utilized by the tissues?

The experimental work of Carrel and Guthrie has shown that a patent anatomosis is possible if a proper technique is used. As to the second question, most authors have agreed that the venous valves represent a major obstacle to the retrograde flow of arterial blood in the vein. However, Leger and Oudot have shown in experimental work on animals that if the valves are destroyed surgically a retrograde flow is possible. To the third question, Leger and Oudot have given a positive answer.

Ninety-seven cases in which arteriovenous anastomosis was carried out for arterial occlusion are compiled from the literature. In 52 of these the anastomosis was done after the onset of gangrene, with the following results: in 15 cases the anastomosis was unsuccessful or followed by death; in 28 cases amputation was necessary after transitory improvement; and in 9 cases the results were favorable. On the other hand, in 45 cases the anastomosis was performed before the onset of gangrene and the results were unsuccessful in 5 cases, partially successful (transitory improvement) in 16 cases, and favorable in 24 cases.

The author adds his personal series of 7 cases, in 3 of which the results were unsuccessful. In the remaining 4 cases good clinical results were obtained and maintained from 2 to 6 months after the procedure.

In performing the anastomosis the author uses a continuous suture of No. 00000 silk with two stay

sutures in preference to a plastic prosthesis. Whenever possible an end-to-end anastomosis is used. The venous collaterals are ligated in preference to destruction of the valves.

In conclusion, the author believes that arteriovenous anastomosis should be considered as an ultimate attempt at conservative treatment before amputation. Also, it may occasionally permit a more limited amputation. —*René B. Menguy, M.D.*

The Use of Rigid and Flexible Plastic Prostheses for Arterial Replacement. CHARLES A. HUFNAGEL. *Surgery*, 1955, 37: 165.

AS A RESULT of work with over 400 prostheses implanted in animals and patients, the author has laid down certain criteria of importance in the successful establishment of rigid prosthetic substitutes. These include the ability of the material to resist clotting, to have adequate strength, be biologically inert, to have an internal surface which is extremely smooth, to be capable of effecting a smooth junction between vessel and tube, to minimize turbulence and to be anastomosed to the vessel by a method which does not produce necrosis of the arterial wall at the point of junction. Among the materials used have been methyl methacrylate (lucite, plexiglas), polyethylene, teflon, kel-F, nylon, stainless steel, vitallium and other metals. In addition various other materials coated with silicone, and in particular silicone rubber, have been used. Of all the materials tested methyl methacrylate has been considered outstanding. For anastomosis between a rigid tube and arterial wall, the process of "multiple-point fixation" has been utilized. It consists of securing fixation by multiple-point pressure on the circumference of the arterial wall, avoiding continuous circumferential pressure. In selected locations such as the aorta a rigid tube with multiple-point fixation has been extremely satisfactory.

Vinyon, nylon, orlon and dacron have been used in the study of cloth-type flexible prostheses. Of the materials tested to date, orlon seems to be superior as it combines the properties of lack of clotting, permanent patency, and ease of handling. Hufnagel has used a 75 by 100 or 100 by 100 weave of type 81 orlon fiber. It is necessary to wash these cloths carefully because of the foreign material left on them in their processing. Tubes have been formed by sewing material with single and double seams either by hand or by sewing machines with orlon or nylon thread on an extremely fine needle. The materials are washed with detergent, rinsed through at least three rinses of distilled water and are autoclaved by the standard method for fabric.

Grafts are inserted by the usual standard everting suture technique, using No. 00000 silk. Grafts have been implanted in the abdominal aorta of dogs and have been 5 cm. in length when of the Y variety. In the thoracic aorta, grafts have varied from 5 to 10 cm. in length. In the abdominal aorta, the author states that "we can now expect from 90 to 95 per cent successful grafts at the end of six months." Clotting, when it occurs, tends to occur relatively early and has usually been due to improper fit of the graft or to inadequate estimation of the length of the graft, thereby producing excessive angulation. Following placement of the tube graft of orlon, a fine layer of fibrin is deposited on the surface which is quite smooth and apparently resistant to clotting. The fibrinlike material is invaded by one or two cell thicknesses of flattened cells, on the surface of which is an endothelial layer. At the end of approximately 90 to 120 days the graft is completely covered on the inside and on the outside of the cloth there is another layer of fibrous tissue which is 4 to 10 cells in thickness.

Fifteen such grafts have been implanted in patients primarily for resection of aneurysms and occlusions of the aortic bifurcation. There have been no failures and no complications over a period of approximately 10 months. —*Allan D. Callow, M.D.*

Method of Blood Vessel Anastomosis by Means of Metal Clips; an Experimental Study. PETER B. SAMUELS. *Arch. Surg.*, 1955, 70: 29.

THE AUTHOR presents a method for obtaining a rapid anastomosis of the arteries by means of V-shaped clips of stainless steel which are applied at distances of 1 mm. about the circumference of the vessel anastomosis. The clips are hand-made from No. 302 cold-rolled, full tempered stainless steel of 0.005 inch thickness. They are applied with ordinary straight and curved forceps.

Approximately 52 anastomoses of the thoracic aorta were performed in mongrel dogs. Thrombosis occurred in only 1 case in which a silver clip had been used prior to use of the brass clip. After anastomosis a short longitudinal turn was seen to extend from the clip line and it appeared that the dull point of the silver clip failed to grip one side of the tear and in consequence the clip was rotated into the lumen, when a thrombus developed around it.

The author has utilized the principle of Carrel in applying guy sutures to the artery to be anastomosed, to obtain stability. On gross inspection a definite fibrous layer appears to surround and overlie the clipped line by the second postoperative week. The lumen shows a circular depression of the anastomotic site which is almost obliterated by the end of the fourth month. The clips remain invisible from the intimal surface. The cleft in the intimal surface is filled with fibrin when inspected microscopically. The edges held by the clips begin, within 2 to 3 days, to show signs of pressure necrosis and within 3 to 4 days the fibrinous coats on the internal and external surfaces are invaded by vascular granulation tissue which is converted gradually into fibrous tissue over a 2 week period. Endothelial cells cover the granulation tissue fibrin mass within 3 to 4 days. Complete reconstitution of the intima takes 3 to 4 months.

The great advantage of the method, according to the author, is the rapidity with which it can be performed. With this method the requirements of a good vascular anastomosis is observed.

—*Allan D. Callow, M.D.*

Repair of Laceration of Superior Mesenteric Artery Acquired by Nonpenetrating Injury to the Abdomen. LAWRENCE E. ULVESTAD. *Ann. Surg.*, 1954, 140: 752.

THE AUTHOR, in reviewing his World War II battle casualties which he operated upon personally at a field hospital in the European Theater of Operations, found

that in 109 cases of penetrating wounds of the abdomen there were no injuries to the superior mesenteric artery.

Klass has reviewed the literature on the surgical approach to disease of the superior mesenteric artery and quotes Ficarro who found that there were only 32 survivors among 554 patients with superior mesenteric occlusion by embolus treated by resection. Klass then reports 2 cases of embolectomy of the superior mesenteric artery in which the patients survived 48 hours. At autopsy in 1 case it was found that the artery was patent, with normal color of the bowel, and that death was due to myocardial failure. In the second case, death was due to massive intraperitoneal bleeding from failure to ligate the veins lacerated in the dissection, adjacent to the superior mesenteric artery; there was patency of the superior mesenteric artery and the color of the bowel was normal.

Because of the hope raised in these cases of Klass, the author presents a successful repair of a laceration of the superior mesenteric artery in a nonpenetrating injury to the abdomen.

A white male received a compressing injury to his upper abdomen when he was caught between a truck and a loading platform. Physical signs and examination indicated that laparotomy should be performed. At the time of the operation it was discovered that the small bowel beginning 18 inches distal to the ligament of Treitz and continuing to the cecum was without blood supply and that the large bowel to the mid-transverse colon was without circulation. Subsequent dissection revealed that the superior mesenteric vein was raggedly torn and widely separated and had to be ligated. Further dissection revealed a longitudinal laceration of the superior mesenteric artery about 6 mm. in length. Three No. 00000 arterial silk sutures were placed to close the laceration in the artery and within a few seconds the circulation of the small bowel and colon was restored. The patient's convalescence was uneventful.

In trying to determine the mechanics of the injury in a nonpenetrating blow to the abdomen, one would have to say that the blow from either the tailgate of the truck or the loading platform struck the abdomen in such a way that the superior mesenteric vessels were impinged on the vertebral bodies. While the vein was badly mangled, fortunately the artery was lacerated so that massive bleeding did not occur until after the abdomen was opened. The laceration could be readily repaired. —*Alan L. Dorian, M.D.*

Surgical Treatment of Internal Carotid Thrombosis. A. DE SOUSA PEREIRA. *Ann. Surg.*, 1955, 141: 218.

A STUDY of the results of surgical treatment in 31 patients with thrombosis of the internal carotid artery revealed some facts of therapeutic interest.

Various surgical procedures had been employed in these patients in an effort to find the most satisfactory operation. Attempts to revascularize the ischemic area of the brain by a collateral circulation developed from a graft of temporal muscle implanted on the cerebral cortex did not meet with success. No clinical improvement was observed and it was not possible to show by postoperative angiographic studies that a new collateral circulation had developed at the level of the graft between the branches of the external carotid artery and the cerebral ischemic territory.

Reversal of the cerebral circulation by carotid-jugular anastomosis was also attempted by the author in the hope of obtaining arterial revascularization of the brain through venous channels. No postoperative clinical improvement was observed, and in 2 cases there was aggravation of the neurological signs.

A study of these patients after operation showed that the carotid-jugular anastomosis was followed by a diminished arterial blood flow to the cerebral area of the internal carotid. No arterial blood was seen to arrive at the distal cerebral veins and capillaries. The carotid-jugular anastomosis merely diverted arterial blood from the external carotid to the jugular vein of the opposite side through the venous sinus of the brain.

Resection of the thrombosed portion of the internal carotid artery with replacement by a vascular graft was equally unsuccessful. The superior extremity of the obliteration was intracranial and it was not technically possible to use this therapeutic method.

Re-establishment of the lumen of the internal carotid artery in 3 cases of obliteration localized below the origin of the ophthalmic artery was not successful. These attempts ended in resection of the carotid artery. More satisfactory clinical and angiographic results were obtained when arteriectomy and superior cervical sympathectomy were performed.

In the treatment of patients with thrombosis of the internal carotid artery or its branches, the best results were obtained either by interrupting the cerebral vasomotor pathways alone, or with ligation of the external carotid artery. Three types of sympathetic operations were employed: (1) bilateral inferior cervical sympathectomy and perivascular sympathectomy; (2) bilateral superior cervical sympathectomy and perivascular sympathectomy; (3) inferior cervical sympathectomy and perivascular sympathectomy on one side, and superior cervical sympathectomy, carotid sympathectomy and ligation of the external carotid artery on the other side.

—*Ely Elliott Lazarus, M.D.*

BLOOD; TRANSFUSION

Prevention of Accidents in Blood Transfusions. ALEXANDER S. WIENER. *J. Am. M. Ass.*, 1954, 156: 1301.

IN THE PRESENT REPORT the author discusses some of the reactions following blood transfusion and methods of their prevention. Accurate blood grouping and cross-matching are essential and demand the service of trained technicians who specialize in this work. The author suggests methods whereby trained workers, such as medical students or central blood bank technicians, can be made available in emergencies and at night, and untrained personnel can be avoided. Several cases (some with a fatal outcome) are presented in which a house officer, in emergency situations, did his own grouping and cross-matching tests, in error.

A plea is made for the abolishment of the use of universal donor blood except in absolute emergencies. Rh-positive blood should be given to a nonsensitized Rh-negative recipient only as a lifesaving measure.

Transfusions of blood of the corresponding A, B, and O groups and Rh_0 type is not sufficient to guar-

antee that a hemolytic reaction will not occur. In rare instances, isosensitization to factors other than A, B, and Rh_0 has been detected. Therefore, the conglutination method of cross-matching should be used routinely; and the antiglobulin test should be used instead for cases in which a transfusion reaction has occurred. The antiglobulin method of cross-matching should always be used for any patient whose history suggests the possibility of isosensitization (especially patients with erythematosus and acquired hemolytic anemia).

The risk of transfusing contaminated blood is an ever present one. This possibility can be minimized, according to the author, by (1) limiting the period of storage to 14 days, and (2) examining a stained smear of the blood from the bottle immediately before transfusing.

As yet, there is no method of preventing the transmission of the virus of hepatitis and this is one of the calculated risks of blood transfusion. The transmission of hepatitis from pooled plasma can be reduced by storing the plasma as a liquid at room temperature for at least 6 months. The use of group-specific plasma is urged.

Blood transfusion, therefore, is accompanied by many hazards and should be used only if indicated.

—*Robert Paradny, M.D.*

The Natural History and Management of Hemolytic Transfusion Reactions. GEORGE DISCOMBE. *Lancet*, Lond., 1954, 2: 936.

THE EXPERIENCE with transfusions of bank whole blood at the Central Middlesex Hospital in London, England is given. There was 1 reaction per 5,000 bottles due to an unexplained cause, and 1 reaction per 1,760 bottles due to avoidable error. Of the latter group the outstanding feature was that the vast majority of the reactions were mild.

The mechanism of death from incompatible transfusions is unknown and the author believes that alkalinization is not only useless but perhaps harmful. Preexistent tubular disease seems to be a requisite for death due to incompatible transfusion from the histologic evidence. The role of allergic response is less clear, but apparently very significant in the severe reactions. Clinically, convulsions, hypotension, and respiratory embarrassment are of far graver prognostic value than are oliguria, hemoglobinuria, and fever.

The use of vasopressors in nonionic fluids is recommended for therapy of the very serious acute "hemolytic shock" type of reactions, while the usual carefully regulated fluid and metabolic program for those with prolonged oliguria is suggested. In both, the avoidance of "biochemical insult" (of sodium lactate or sodium sulfate) is stressed.

—*Robert W. Williams, M.D.*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Diagnosis of Postoperative Thromboembolic Complications. W. J. H. SCHMIDT. *Arch. chir. Neerl.*, 1954, 6: 253.

BEGINNING IN 1948, at the University Surgery Clinic of the Wilhelmina Gasthuis, an investigation was started in an attempt to improve the clinical diagnosis of postoperative thromboembolic disease. It was hoped that by earlier diagnosis lung embolism might be prevented and that by earlier therapy the postthrombotic complaints might be reduced.

A total of 6,506 patients, of whom 4,455 were operated upon, was included in the study. The patients were examined at least twice daily, preoperatively and postoperatively. Specifically, the pulse, temperature, and respiratory reactions, edema, dilated veins and vascular spasms, discoloration, local changes in temperature, anxiety, and spontaneous pain and tenderness of the vessels on pressure were noted. With reference to lung embolism, the following symptoms and indications were looked for: pain, dyspnea, cyanosis, shock, cough, blood-stained sputum, physical signs, pulse, temperature, and respiratory reactions. Electrocardiographic and x-ray findings also were noted.

Although the temperature, pulse, and respiratory action have been thought to be of particular significance in the diagnosis of thromboembolic disease, these findings were found to be of little value in early diagnosis. Pulmonary embolism occurs in the absence of fever.

Repeated measurements of the legs were carried out in 600 instances. It was not unusual for an increase of as much as 0.5 to 1.0 cm. in the circumference of the extremities to be noted postoperatively. In 12 patients in whom the diagnosis of thrombosis was finally made, the circumference of the leg below the knee was increased by more than 1 cm. However, in only 49 of 117 instances of pelvic or lower leg thrombosis was edema noted. In only 2 cases did the edema appear as a suspicious sign before the diagnosis was made. The authors concluded that the presence of edema is of little value in the early diagnosis of thrombotic disease.

Although venous congestion is often found in the classical syndrome of thrombosis of the leg, in the author's experience the earlier the diagnosis, the less frequently was venodilatation encountered. Arterial spasm was noted; however, the variations were so small when recorded that no definite conclusions could be drawn with reference to early diagnosis. The earlier the diagnosis of thrombotic disease of the veins of the lower extremity, the less will be the discoloration of the skin. Consequently, this sign is of little value in early diagnosis, as are the local changes in temperature.

Various reports in the literature have noted the feeling of anxiety which precedes thrombosis and pulmonary embolism. Of 2,000 patients studied, 176 gave the impression of being anxious although there was no apparent reason for this feeling. The diagnosis of thrombosis was made in 54, and of pulmonary embolism in 17 patients. In this group, only 9 per cent of the patients with thrombosis and 25 per cent of those with embolism showed an unexplained anxiety. The authors conclude that this symptom is untenable to use as an early aid to diagnosis.

Spontaneous pain and tenderness of the vessel were the two most important factors to be noted in the early diagnosis of thrombosis. Pain may be a very vague sensation of tenseness, stiffness, or a numb feeling. Whatever the sensation, it is described as disagreeable. The authors outline the various maneuvers to be followed in palpating the foot and the leg for tender vessels; they consider that palpation of the calves while the knee is bent, from the insertion of the Achilles tendon up to and including the popliteal fossa, is the most important single procedure. Indeed, this particular maneuver elicited symptoms in 90 of 117 patients in whom the diagnosis of thrombosis was made. The Homans-Payr sign was found to be unreliable.

Pulmonary embolism must not be considered a complication but a part of the syndrome of thromboembolism. The pain of pulmonary embolism as in peripheral thrombosis showed extreme variations in location and intensity. Dyspnea and cyanosis, if unaccompanied by other signs or symptoms, were of little value in the diagnosis of pulmonary embolism. Any more or less serious pulmonary embolism causes signs of shock and it is the author's feeling that in any nonfatal pulmonary embolism the patient rapidly recovers from the shock state. Cough and blood-stained sputum are factors on which little diagnostic value can be placed. There are rarely clear physical signs following pulmonary embolism since a pulmonary embolism may occur without pulmonary infarction. Indeed, the clearest sign of infarction is found only after a few days. No physical signs were noted in approximately one-half the instances of pulmonary embolism. The pulse, temperature, respiratory reactions, the electrocardiographic and x-ray findings were not of diagnostic value in the absence of other signs, nor did the absence of changes in any of these features preclude the diagnosis of pulmonary embolism.

The over-all incidence of thromboembolic disease was approximately 3 per cent. The incidence in patients operated on was approximately 3.75 per cent. The incidence of unexpected pulmonary emboli was 1.5 per cent and that of fatal pulmonary embolism approximately .45 per cent. Although during this study the entire medical personnel were alerted to this disease there has been little alteration in the incidence of thromboembolism during the period of study. Several generalizations can be made:

1. The older the person the more frequent thromboembolic disease appears.
2. In this particular study the greatest incidence occurred in July.

3. In more than 40 per cent of the cases an unexpected pulmonary embolism was the first sign pointing to postoperative thrombosis.

4. Fatal lung embolism was the first sign in 13.5 per cent of all postoperative thromboembolic complications.

5. One-third of the patients who had a pulmonary embolus died.

6. The greatest emphasis is to be given to spontaneous pain and tender muscles as features of the early diagnosis of thromboembolism.

—*Jerry A. Stirman, M.D.*

Metabolic and Hemodynamic Changes Induced by the Prolonged Administration of Dextran. JOHN R. JAENIKE and CHRISTINE WATERHOUSE. *Circulation*, 1955, 11: 1.

LARGE AMOUNTS of the polysaccharide dextran, both 6 per cent and 12 per cent solutions, were administered to 8 human subjects under standardized metabolic conditions. The molecular weight of the material ranged from 25,000 to 185,000 with an average of 70,000. The results of the studies were as follows:

As has been demonstrated by others, dextran is a potent osmotic substance which produces marked salt and water retention and rapid plasma volume expansion, with prolonged depression of venous hematocrit. Rapid urinary excretion occurs during the period of dextran administration and thereafter quickly diminishes; about 50 per cent of the material is so accounted for.

Transient nitrogen and phosphorus-sparing and an antiketogenic effect were noted during the dextran injection period which subsided soon after discontinuance of the injections. It is suggested that these phenomena are associated with the slow and constant metabolic utilization of dextran. The metabolic effects of glucose and dextran were not comparable in the subjects studied. Abrupt cessation of nitrogen-sparing may be associated with the fact that a fraction of the dextran remains confined to the vascular space and does not diffuse into those tissues in which enzymatic degradation takes place. A fraction of the dextran, presumably of high molecular weight, remains circulating for a prolonged period of time and is associated with a sustained depression of the venous hematocrit. Metabolism of this fraction cannot be demonstrated, and its ultimate fate in the body is unknown.

Serum protein appears to leave the circulation during the period of rapid plasma expansion, and sometimes returns to supernormal levels, in which instance the plasma volume remains expanded at a time when serum dextran concentration is falling.

No evidence of renal impairment secondary to dextran administration was observed. Three patients showed transient microscopic hematuria without albuminuria. These same subjects, and one other, showed a generalized tendency to bleeding. Three patients received large amounts of 12 per cent dextran and the fourth received large amounts of 6 per cent dextran. The bleeding appeared after 2 to 4 days of dextran administration. Further study is necessary to define the mechanism involved. One subject experienced exacerbation of her chronic dermatitis on the third day of dextran administration, and a 58 year old male who was mildly hypertensive developed pulmonary congestion after 2 days (240 gm.) of dextran. The amounts of dextran used in these studies are in excess of the usual clinical dosage.

—*Edwin J. Pulaski, M.D.*

Functional Graft of the Heel. LORENZO MIR Y MIR. *Plastic & Reconstr. Surg.*, 1954, 14: 444.

THE AUTHOR recommends reconstruction of the heel with use of a flap (external base) taken from the sole of the opposite foot, as no other teguments are so well prepared for their functional purpose to support and carry the weight of the organism. Therefore he calls it a "functional graft of the heel."

As the donor zone, he uses the concave part of the other sole, a functionally "indifferent" (nonsustentacular) zone which does not interfere with the later function of the donor foot.

The positional immobilization of the patient which is required during the transfer is relatively easy and tolerable, and allows the mobilization of both knees; thus it is well tolerated even by old people and difficult patients. —*Ely Elliott Lazarus, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

An Anesthetist Looks at a Burned Child. D. W. SHANNON. *Lancet*, Lond., 1955, 1: 111.

TREATMENT of the acutely burned patient is directed toward the prevention of tissue anoxia by restoring the total circulating blood volume, correction of deficits in the oxygen-carrying capacity of the blood, and the maintenance of normal pulmonary ventilation with oxygen.

Calculation of fluid therapy is based on "replacement fluids" and "requirement fluids". Replacement fluids consist of equal parts of plasma and saline solution, the total amount figured from formulas advocated by Barclay and Wallace (1954). This formula is based on the age of the patient and the extent of the burn. Since the use of the formula may lead to overloading of the cardiovascular system in extensive burns, different formulas are used for burns of more than 30 per cent body surface. Requirement fluids are calculated as the normal fluid requirements of the patient and are given by mouth if practical, or as 5 per cent dextrose in water, intravenously.

In deep burns and in extensive superficial burns, large amounts of red blood cells are destroyed, thus reducing the oxygen-carrying capacity of the blood and contributing to shock. To correct this acute anemia the authors substituted fresh whole blood for half of the calculated replacement fluids.

The maintenance of normal oxygen tension and levels in the lung is of equal importance in restoring the blood volume. Of major importance is a patent airway. After burns about the face or the inhalation of noxious fumes, tracheotomy or intratracheal intubation may be required. Excessively rapid intravenous fluid administration must be avoided since pulmonary edema may occur. The respiratory rate may be increased without a proportionate increase in depth if there is central stimulation from pain. Pulmonary

ventilation is thus diminished. The judicious administration of opiates alleviates pain and permits more effective respiration. The authors give oxygen at the rate of 2 to 3 liters per minute by nasal catheter to all children with body burns of more than 30 per cent.

An attempt is made to keep the oxygen demand at a minimum by gentle handling and by the administration of diamorphine hydrochloride, half subcutaneously and half intravenously, to allay anxiety. (The use of diamorphine hydrochloride, heroin, is precluded in the United States since manufacture of the drug is illegal). When anesthesia is required for dressings or débridement the use of a minimum of preanesthetic medication and a short acting anesthetic agent will permit prompt return of the ability to take the special dietetic regimen. Cyclopropane has usually been the anesthetic of choice. Since profound relaxation is usually not necessary, this agent is frequently used in grafting procedures also. An endotracheal tube is employed with burns about the head, when the location of the burn is such that positioning of the patient makes it difficult to maintain a clear airway, and whenever respiratory embarrassment cannot be relieved by manipulation or an oral airway.

Atropine is given preoperatively routinely. Barbiturates and opiates are rarely used. Blood transfusion is done preoperatively to maintain the hemoglobin above 80 per cent, and transfusions are given during all operations which are associated with blood loss. During the past 8 years the only complication during anesthesia administration has been an occasional bronchospasm. Cardiac irregularities associated with the use of cyclopropane are rare in children.

—Lockert B. Mason, M.D.

Management of the Burned Elderly Patient. Sidney E. Ziffren. *J. Am. Geriat. Soc.*, 1955, 3: 36.

The mortality rate following a burn in an aged person is very high. It has been pointed out that in the United States a burn of 13 per cent of the body surface carries a 50 per cent mortality in a person over 61 years of age, and this rate increases with the patient's age and the area of the burn.

The case history of 34 burned patients 60 years and older were reviewed. All had burns of more than 5 per cent of the body surface, of a third-degree nature. There were 15 deaths, or an over-all mortality rate of 41.1 per cent. The mortality rate appeared to climb sharply after the age of 70. More than 66 per cent of the patients who died from burns had proved infarcts of one or of several organs. Burns cause severe stress and in the aged this may be of greater importance than in younger patients. There are suggestions that a burn in itself results in a tendency toward thrombosis.

The newly burned geriatric patient, even if sustaining burns involving only 5 per cent of the body surface, should be treated vigorously to prevent shock. The danger of shock and chronic hypovolemia in the aged, with the greater danger of irreversible deterioration, make vigorous treatment imperative. During the early period (the first 48 hours after burning) the two great dangers are overloading the circulation and undertreatment. In the aged, the former is usually the greater hazard. It is inadvisable to use the hematocrit as a guide to fluid administration. The most practical and safe guide is the urinary output. By placing an indwelling catheter in the bladder and watching the hourly output of urine, the intravenous flow of fluids may be regulated without the danger of inducing pulmonary edema. The specific gravity of the urine should be determined as well.

Because of the marked red blood cell loss, administration of whole blood to combat shock is not only more effective than the administration of plasma, but it prevents the severe anemia which otherwise occurs. Moreover, in the aged, a reduced blood volume is not uncommon. If severe trauma such as a burn is imposed upon such a person, the need for blood is even more acute. Blood transfusion should be started immediately in order to prevent the onset of shock from which the elderly patient may never recover. A urinary output of 25 to 50 ml. per hour should be maintained. After the administration of 500 ml. of blood, a combination of physiologic sodium chloride (400 ml.) and sixth molar sodium lactate (100 ml.) should be used. The saline-lactate mixture more closely resembles the electrolyte structure of extracellular fluid and is less likely to result in acidosis. Ordinarily, equal amounts of blood and of the saline-lactate mixture are used, but the quantity of the saline-lactate to be administered should rarely be greater than 1,500 ml. in 24 hours; otherwise, there may be more edema. Whenever the patient can take fluids by mouth this route should be used to make up the electrolyte deficiency in preference to the intravenous route. A mixture of 1 teaspoonful (4 ml.) of salt and 1 teaspoonful of baking soda in a quart of water will provide the proper concentration of electrolyte in fluid given orally without the danger of fluid overload and consequent further edema.

Early débridement and grafting of the burns is imperative. To perform a débridement safely in an aged individual, satisfactory and adequate blood replacement must be available, otherwise irreversible shock may occur from the blood loss that inevitably takes place at the time of débridement. Because of the severe stress the patient is undergoing, the necessity for adequate quantities of vitamin C must not be overlooked. The administration of testosterone, 75 to 100 mgm. three times weekly, is often of value after the burned areas have been grafted, as it may help to bring the patient into positive nitrogen balance more rapidly. However, occasionally salt retention and edema occur, largely because of the effect of the steroid on renal tubular function, which is greater sodium reabsorption.

Serious consideration should be given to amputation in an aged patient who has a severe burn of the lower extremities. The mortality from amputation is lower than the mortality rate from the usual procedures necessary in the treatment of such a burn, i.e., débridement and the removal of skin for grafting. This may seem radical, yet be the most conservative way of saving life. *—Stephen A. Zieman, M.D.*

Effect of Early Excision of Experimental Burns. A. W. Farmer, W. R. Franks, D. M. Young, M. Maxmen, and L. R. Chasmar. *Brit. J. Plast. Surg.*, 1955, 7: 289.

The question of whether the early removal of burned tissue may alter the outcome in burns has never been

Fig. 1 (Carroll, Sinton, Garcia). Acute deposits of calcium in collateral ligaments; both deposits disappeared. Left, Deposit in collateral ligament of distal interphalangeal joint in third digit of right hand of 47 year old patient. Right, Deposit in collateral ligament of proximal interphalangeal joint of right index finger of 65 year old patient.

definitely settled. Vogt, in 1912, and Robertson and Boyd, in 1923, believed they kept animals alive by the early excision of burned areas; this was not confirmed by others. Harrison and Blalock reported that in extensive injuries the removal of burned skin failed to increase survival tissue. Clinically, early excision has been practiced on only small burns in which the effect of excision on physiological balance has been difficult to evaluate. The authors investigate the effects of early excision of burned skin in scalded mice.

In a well controlled series of experiments, mice were scalded in a standard manner for varying periods of time, and the effects of early excision were compared against the controls with regard to survival rates, bleeding weights, hemoglobin levels, the quantity of fluid collecting in the scalded skin, and the absorption of intraperitoneal saline solution. By bleeding weight is meant the weight of the blood collected on sectioning a major vein and artery and allowing them to bleed until it stops. On the basis of these experiments, the authors found the following:

1. Early excision of scalded skin in mice reduced the mortality rate, decreased the reduction in bleeding weight which signified less shock, and decreased hemoconcentration.

2. The procedure of excision itself constituted a trauma to mice.

3. After a delay of 2 hours after the initial burn, excision of the burn was harmful as measured by the same criteria. To be helpful, it must be done early.

4. The fluid content of skin scalded at 75 degrees C increased continuously for 6 hours after scalding. If the burned skin was excised and put back into place, the passage of fluid into the skin did not occur.

5. The quantity of fluid conserved by early excision of the scalded skin was greater than the amount saved by the fall in bleeding weight.

6. The burned mouse excreted less intraperitoneally injected saline solution after the burn during the period when the bleeding weight had fallen. If the animal survived, both returned to normal 24 hours after the burn. —*Carl Schiller, M.D.*

Acute Calcium Deposits in the Hand. Robert E. Carroll, William Sinton, and Alexander Garcia. *J. Am. M. Ass.*, 1955, 157: 422.

One hundred consecutive cases of acute calcium deposits in the hand were analyzed. Either sex may be affected. The youngest patient was 13 years, the oldest 81.

Characteristically, there was the sudden spontaneous onset of intense pain aggravated by motion of the part. Rapid swelling of the area occurred in 85 per cent of the patients. On examination there was voluntary splinting of the wrist or digits. In addition to swelling, there was redness in 80 per cent. In some instances red streaks characteristic of lymphangitis were noted, but in no case was there regional lymphadenitis. By careful examination one point of maximal tenderness could be isolated. The localization of this point was important for roentgenographic studies, since deposits of calcium might not be observed in routine projections of the hand. The diagnosis was suspected from the history and examination, and was confirmed roentgenographically by calcium deposits in the soft tissues of the wrist, hand, or digits.

Although only one-third of the patients could recall unusual strain or trauma to the hand, trauma is considered the cause of acute calcium deposits. Local necrosis of the tissue causes the deposition of calcium phosphate and calcium oxalate. The calcium salt is extremely irritating and as the deposition increases, pressure and pain develop.

Calcium deposits occurred in the ligaments and tendons of the wrist and hand in any location. The flexor carpi ulnaris tendon in the vicinity of the pisiform carpal bone was the most common site.

The disease is self-limited, but treatment will afford relief and shorten the course. Without treatment the average duration of symptoms was 20 days. Splinting or warm water soaks lessened the period of pain and disability. The local injection of 1 per cent procaine followed by hot soaks gave freedom from acute pain within hours, and relief of all painful symptoms in an average of 6 days. Incision of the area yielded prompt relief, but since other methods of treatment are satisfactory there is little indication for surgery.

In this series of patients there was no recurrence of symptoms. In the cases which could be followed roentgenographically the calcium deposits disappeared in an average of 14 days, and in no instance did they persist longer than 6 months.

An awareness of this syndrome will undoubtedly result in a correct diagnosis and treatment of many instances of hand symptoms which have been heretofore misdiagnosed. —*Lockert B. Mason, M.D.*

Autograft of the Amputated Digit. HAROLD GILLIES and DOUGLAS A. CAMPBELL REID. *Brit. J. Plast. Surg.*, 1955, 7: 338.

IN 1940, Gillies first suggested a method for the immediate grafting of an amputated finger. The skin is dissected off and the nail is avulsed. The tendons of the severed portion are sutured to the corresponding tendons of the stump. The attached denuded finger is buried in a subcutaneous pocket in the abdominal wall or below the clavicle in the male and the skin edges of this pocket are sutured to the skin of the stump in a circumferential manner. The flap can be divided after a suitable period of time and the grafted finger, now covered with new skin, is freed from its pocket.

Gordon reported the first successful case in 1944, and Wilfingseder reported 3 successful cases of autografting the thumb at a level at or near the metacarpal phalangeal joint. Although one thumb was later lost because of infection during a corrective procedure, the remaining 2 showed good functional and corrective results; in one thumb normal sensation developed, with regrowth of the nail. However, the interphalangeal joints did not function properly; they were subluxated and required arthrodesis.

The authors add the fifth successful case to the literature by reporting a case in which a 17 year old girl lost the index, middle, and ring fingers of her major hand. The index finger, which was divided through the distal end of the middle phalanx, was grafted back in place successfully by this method, and it developed good function and sensation with regrowth of the nail, but without movement at the distal interphalangeal joint. It is suggested that repair of the digital nerves, and preservation of the original skin by grafting it to the abdominal wall for later regrafting to the finger might further improve sensation.

—Carl Schiller, M.D.

Staphylococcal Infections in General Practice. LEONARD ROODYN. *Brit. M. J.*, 1954, 2: 1322.

THE AUTHOR presents an interesting discussion of the problems encountered in the treatment of boils purely from an office practice standpoint. Previous studies have been carried out almost exclusively in hospitals. The author emphasizes that the family physician is well placed to consider certain problems of staphylococcal infections.

In addition to the identification of the organism, various sensitivity tests were performed by the routine dried disc method. In this investigation, 93 of the strains isolated from the purulent material of boils and styes were tested for penicillin sensitivity, and 23 (25%) were found to be resistant. A recurrence of infection was noted in 20 per cent of the patients studied in this series. In 12 cases recurrence was observed in 1 to 5 months, in 3 cases after 10 to 14 months, and in 1 case after 18 months. In every case of recurrent infection, the type of staphylococci recovered from the initial lesion was identical with that obtained from the subsequent lesion. It was concluded, therefore, that in the patient suffering from recurrent crops of boils or styes, there was failure to eliminate a particular strain of staphylococcus rather than repeated fresh infections with strains of different types.

Although there have been many reports of institutional outbreaks of staphylococcal infection, only one account could be found in the literature of the spread of these infections within the home. It seems apparent that a high nasal carriage rate of staphylococci occurs in normal people. Such may occur from 25 to 50 per cent of normal subjects. In the present study, the staphylococci were cultivated from nasal swabs in 68 per cent of the patients studied. On comparing the strain from the lesion and the nose in 25 cases in another series, the organisms were found to be identical in every case. Other authors have mentioned that the nose is the primary source of infecting organisms in most cases of staphylococcal dermatoses. Such may be true of sycosis barbae and impetiginous lesions of the face, but in the series being reported with boils, 32 per cent of the patients studied carried no nasal staphylococci and an additional 17 per cent carried different strains in the primary lesions from those in the nose. Self infection, therefore, from a reservoir of staphylococci in the nose could have occurred in only about 51 per cent of the cases of boils studied. In the cases of styes, however, where there was a higher nasal-carried rate, and strains from the lesion and the nose were identical in all of the cases tested, nasal staphylococci probably played a more important part.

—Orville F. Grimes, M.D.

Unaltered Penicillin Susceptibility of Streptococci; Study of Alpha Hemolytic Streptococci Causing Endocarditis. CARL A. BERNSTEN, JR. *J. Am. M. Ass.*, 1955, 157: 331.

THE AUTHOR studied 26 strains of alpha streptococci isolated from patients with endocarditis between January, 1944 and January, 1947 for the purpose of determining whether there was any significant change in their penicillin susceptibility. He concluded that there was no significant change in the penicillin susceptibility in his series of 26 strains of alpha hemolytic streptococci isolated from patients with bacteriemia and bacterial endocarditis. He believed that the absence of change in such an ubiquitous organism as the alpha streptococcus emphasized that the problem of the increased prevalence of penicillin-resistant micrococci did not necessarily represent a phenomenon with general application to all penicillin-susceptible microbial species.

—Harold L. Method, M.D.

ANESTHESIA

Controlled Hypotension. DONALD E. HALE. *Anesthesiology*, 1955, 16: 1.

THE DELIBERATE LOWERING of the blood pressure to decrease the danger of certain operations, to diminish blood loss, and to facilitate and expedite certain other surgical procedures has recently been done. This hypotension is induced by creating a disparity between the circulating blood volume and the vascular system. The choice of the particular method of inducing hypotension depends upon the site of operation and the condition of the patient. It may be accomplished by ganglioplegic drugs, total spinal anesthesia, or arteriotomy, each with a particular indication.

The complications induced are delayed postoperative recovery, reactionary hemorrhage, difficulty with

vision, anuria, oliguria, cerebral thrombosis, coronary thrombosis, and cardiac arrest. In general, the chief dangers attending hypotension are the results of anoxia, thrombosis, and postoperative hemorrhage.

The chief contraindications to any method include severe, advanced coronary artery disease, angina pectoris, and marked impairment of renal function.

Supplementary anesthesia of intravenous sodium pentothal and endotracheal nitrous oxide oxygen mixtures or oxygen alone have proved satisfactory. Less anesthesia is needed during hypotension. Preoperative analgesic agents contribute in some degree to hypotension.

Arteriotomy was the first method used to produce planned hypotension for a surgical procedure. The blood is drawn from the radial artery into a series of bottles containing an anticoagulant solution. The blood pressure is dropped to a systolic reading of 80 mm. of mercury. All patients respond to this method of producing hypotension. When the hypotension is no longer needed the blood is returned by arterial infusion. This method has been used chiefly during operations on highly vascular intracranial lesions. In the operative treatment of meningiomas a mortality rate of 9.03 per cent has been obtained utilizing planned hypotension as compared to a mortality rate of 70 per cent without hypotension.

Spinal anesthesia produces a preganglionic sympathetic block. It should be sufficiently high to give total sympathetic block, but not necessarily total spinal anesthesia. Ganglioplegia may be produced by interference with the release of acetylcholine, prevention of action of acetycholine on the ganglion cell, and depolarization of the ganglion which results from the application of nicotine or acetylcholine. Hexamethonium is a blocking agent of low toxicity and does not cause stimulation of the nerve terminations or of muscle, has no neuromuscular blocking action and no atropinelike action, does not liberate histamine, and has no anticholinesterase activity. Hexamethonium lowers the blood pressure, and causes warming of the limbs, an increase in the digital blood flow, depression of sweating, paralysis of the bladder, and ileus of the small intestine. The sensitivity of the blood vessel wall to epinephrine is retained. Hypertensive subjects are more sensitive than normotensive ones. Approximately 20 per cent of subjects (chiefly robust young adults) are not affected by the drug. Arfonad apparently has more effect on the musculature of the arterioles than on the ganglia. One of the chief advantages of this drug is the quick onset and the short duration of its action, so that the solution may be given by continuous drip, and the blood pressure controlled by the rate of the administration of the solution.

When arteriotomy is combined with ganglionic block the highly controllable hypotension is induced, for ganglionic block increases and fixes the capacity of the vascular bed which is then no longer able to adapt itself to changes in blood volume.

It is not clear whether hypotension with vasodilation is safer than hypotension with vasoconstriction. In any event, the controlled hypotension should be of as short a duration as possible. The controlled hypotension should not be administered by the same individual who is responsible for anesthesia. The head of the patient should be level with or below the heart. The lungs should be inflated with an oxygen-rich atmosphere throughout the procedure. The patient must be watched after the operation until a safe, stable, blood pressure level has returned. The dangers of controlled hypotension can be decreased by an adequate oxygenation, by careful control of the blood pressure, and by limiting its use to short periods.

—Jerry A. Stirman, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Localization of Parathyroid Adenomas by Arteriography. SVEN IVAR SELDINGER. *Acta radiol.*, Stockh., 1954, 42: 353.

THE AUTHOR reviews in detail, by citing liberally from the literature, the gross anatomy and distribution of the vascular supply of the normal parathyroid glands and of the adenomas arising from them. He arrives at the conclusion that the parathyroid glands are usually situated very close to one of the main branches of the inferior thyroid artery and that, therefore, one of the earliest signs of a parathyroid adenoma is a displacement of the inferior thyroid artery or some of its large branches. As the growing adenoma requires more and more blood, the parathyroid artery increases in size and obviously will also be displaced. Eventually it will be stretched and with expansion of the adenoma into the adjacent tissues it will be displaced outside the normal distribution of the branches of the inferior thyroid artery.

This fact induced the author to attempt localization of parathyroid adenomas with the aid of arteriography, by demonstrating displacement of the branches of the inferior thyroid artery, closely adjacent to and probably supplying the adenoma.

The following technique is employed:

A polyethylene catheter is introduced after percutaneous puncture of the antecubital fossa into the brachial artery. A needle 1.5 mm. in external diameter is used and the catheter is of the same size or a little larger. The catheter is guided until its tip reaches the subclavian artery, a little distal to the thyrocervical trunk. At this moment 10 c.c. of contrast medium, 35 or 50 per cent umbradil, is injected by hand in about 1.5 seconds or longer. The amount and concentration of the opaque substance are important factors because of the close proximity of the vertebral artery and the possible injection of this vessel. The roentgenograms are made in frontal or slightly oblique projections.

The author performed 26 arteriographies (2 in each patient). In 4 of 6 patients operated upon it was possible to localize the adenomas by this method. In 2 of the 4 patients with positive roentgenographic findings, the adenomas were not found at previous operation.

Untoward symptoms occurred in a single case, probably from accidental injection of the vertebral artery. These consisted of a sudden feeling of suffocation and generalized spasm which disappeared in a few seconds. Soon bilateral blindness developed which likewise cleared up completely. One week later, however, impaired hearing appeared on the right side and this became permanent.

The author believes that arteriography, since it is easy to perform, may be desirable routinely before operation, even though most of the parathyroid adenomas are located without too much difficulty. If, as the result of further experience more restricted indications should prove necessary, the following procedure may become more suitable: (1) exploration of the neck, without resection of the thyroid or mediastinal exploration, (2) arteriography, if no adenoma is found; and (3) reoperation. —*T. Leucutia, M.D.*

Cardiopericardial Metastases of Pulmonary Cancer; Anatomopathologic and Roentgenologic Approach on the Basis of 32 Cases (Sulle metastasi cardiopericardiche del cancro del polmone; raffronto anatomopatologico-radiologico su 32 casi). LUIGI VESPIGNANI. *Radiol. med.*, Milano, 1954, 40: 665.

IN A RECENT OBSERVATION of a patient with a hemorrhagic pericardial effusion the roentgenologic examination disclosed a clinically silent pulmonary cancer which led the author to make a comparative roentgenologicoanatomopathologic study of 31 patients with pulmonary cancer in whom the subsequent autopsy disclosed the presence of cardiopericardial metastases. This material comprised 27 of the 35 cases of cardiopericardial metastasis of pulmonary tumors reported by the pathologist, Bruscagnin, from the Anatomo-Pathologic Institute of the Ospedale Civile di Venezia, Italy, observed during the period from January, 1942 to August, 1952 and, in addition, 4 personal observations by the author at the same hospital since the publication of Bruscagnin's thesis.

In addition to the pathologic reports standard roentgenograms were examined. In several instances stratigrams and bronchograms—and in one instance, in addition, a kymogram—were available.

In 15 of this group of 31 patients the heart appeared normal in size and configuration, i.e., the metastatic process could not be demonstrated roentgenologically; in 10 patients, the interpretation was difficult because of the partial masking of the cardiac shadow by the accompanying pulmonary changes or by the presence of a pleural effusion.

In the remaining 6 patients, evidence of the cardiopericardial metastatic process could be recognized roentgenologically. In 3 of these 6 the cardiac shadow appeared to be enlarged in toto; in 2 other instances the so-called middle or left auricular bulge on the left border of the heart was abnormally prominent and in all these last-mentioned instances the auricle, or auricles, were found at autopsy to be involved by metastatic diffusion from the pulmonary tumor, or by extension by contiguity. The remaining patient exhibited a rapidly progressing pericardial hemorrhagic effusion.

From a consideration of the results, the author concludes that every patient who is known to be affected with cancer of the lung should receive an accurate, systematic, roentgenologic study of the heart by every roentgenologic modus available (kymography, pneumomediastinum, angiocardiography) with complementary clinical studies—especially electrocardiography—in order that neoplastic involvement of the intrinsic cardiac nervous mechanism and initial signs of neoplastic diffusion in the direction of the circulatory centers may be detected. Such findings

would be of value both as regards the surgical indications and for purposes of prognosis.

Since this report was completed the author has observed a patient in whom a bronchogenic cancer on the left side resulted in hilar metastases on the right side, and in whom there was also cardiopericardial involvement. In this instance a roentgenologic diagnosis was possible, a diagnosis which was substantiated at autopsy in every particular. In this patient, not only was the enlargement of the hila—particularly of the hilum on the right side, and moderate enlargement of the heart as a whole—recognized with the standard procedure, but the rectilinear left ventricular border suggested infiltration of the pericardium over this region (loss of elasticity of the pericardium). Here the stratigram depicted clearly the massive polycyclic outline of the infiltrated right hilar glands and the cufflike stenosis resulting from the circular envelopment of the bronchus by the primary tumor. Kymography disclosed, in addition, shallow dentations over the left cardiac border in the area of the ventricular apex, resulting from a localized hemorrhagic pericardial effusion and neoplastic infiltration of the left ventricular myocardium in this region.

—John W. Brennan, M.D.

Roentgenologic Demonstration and Analysis of the Diaphragm and Esophageal Foramen (Zur roentgenologischen Darstellung und Analyse des Diaphragmas und Foramen oesophagicum). J. EBERL. *Fortsch. Roentgenstrahl.*, 1954, 81: 270.

THE passage of the esophagus through the diaphragm takes place by way of an oval aperture, the hiatus or foramen, of the esophagus. This hiatus represents a dehiscence in the diaphragm itself, but because it is completely filled by the esophagus and its encompassing fatty and fascial tissues it cannot be demonstrated on the usual roentgenogram and indirect methods must be used for its demonstration. When the diaphragm is depicted at all, the level at which the contrast-filled esophagus is crossed by this shadow does not correspond to the level of the hiatus even in deep inspiration when the saddle appearance of the two diaphragmatic cupulas and the intervening rigid tendinous depression are more or less smoothed out.

The epiphrenic diverticulum is the most reliable guide to the position of the hiatus. This appearance is most easily delineated by means of tomography; however, the hard ray method may, in the usual sagittal projection, permit differentiation of the left contour of this structure from the shadow of the heart.

The contours of the contrast-filled esophagus may be depicted in the posterior mediastinum by means of the hard ray roentgenogram, by tomography, and by the special posturing of the patient. With the patient in the prone position with the left shoulder slightly elevated the film is placed on the patient's dorsal region so as to show the posterior mediastinum free from the heavy shadows of the anterior mediastinum and of the vertebral column posteriorly.

The esophageal hiatus can also be demonstrated with the patient in the usual dorsal decubitus position, when the rays come from below and behind, upward and forward. The epiphrenic space is then almost exactly on the level with the projected contours of the diaphragm which are nearly always distinguishable.

Special difficulty is encountered, especially in obese individuals, when puzzling findings such as a diaphragmatic hernia are noted. The diaphragm may be pressed upward and forward and not appear as a shadow contour. The contrast-filled stomach or intestinal loop, crowded into the unnaturally elevated diaphragmatic cupula, may appear to be lying free in the lung field of the chest.

The difficulties of visualization of this region of the chest and abdomen must be diligently overcome because of the importance of determining the plane of the esophageal hiatus with reference to the epidiaphragmatic or subdiaphragmatic localization of the neighboring structures.

—John W. Brennan, M.D.

Renal Angiography in Cases of Delayed Excretion Following Intravenous Urography. HANS IDBOHRN. *Acta radiol.*, Stockh., 1954, 42: 333.

THE AUTHOR presents a detailed review of the literature on the value of, and indications for, renal angiography, particularly as it has been used in the Scandinavian countries since 1947.

Then he presents his own series of 22 cases from the Roentgendiagnostic Department of the University Clinics of Lund, Sweden, in which renal angiography was performed with the purpose of estimating renal function in the presence of delayed unilateral excretion as found by intravenous urography. The 22 cases are arranged tabularly by listing (a) the sex, (b) the history and clinical findings, (c) the findings of renal angiography (caliber of renal artery of the diseased and of the normal kidney, appearance of the intrarenal branches of the diseased kidney), and (d) the result and type of verification.

It was noted that in 19 of the 22 cases the findings of angiography were directly comparable with the findings at subsequent urography as well as at operation. These are described in extenso and profusely illustrated with reproductions of angiograms and photographs of the surgical specimens.

The conclusion was reached that the width of the renal artery in most cases was a good guide in the evaluation of renal function. However, because of the wide variations which exist even in the normal, renal function may readily be overestimated or underestimated. Further observations are being made on postmortem specimens and in animal experiments; the results will be reported later. *—T. Leucutia, M.D.*

Peritendinitis Calcarea with Multiple Foci in the Finger Joints of a Young Subject. RENZO BOSSI. *Brit. J. Radiol.*, 1954, 27: 692.

THE AUTHOR presents an unusual case of peritendinitis calcarea with multiple localizations in the finger joints of both hands which responded favorably to roentgen therapy.

The condition occurred in a young female, 17 years of age, who was first seen in September, 1952 and gave a history of pain and swelling of several finger joints of about 6 months' duration.

Roentgenograms of the hands revealed amorphous calcifications, localized medially or laterally to the

first joints of the second and fifth fingers, to the second joints of the third and fourth fingers of the right hand, and to the first joints of the second and fourth fingers of the left hand. Roentgenograms of the feet showed similar alterations of a lesser degree in some of the toes. A general roentgenographic survey of the skeleton gave negative results.

The roentgen therapy was carried out with the following factors: 180 kv., 0.5 mm. of copper plus 3 mm. of aluminum, half-value-layer of 1 mm. of copper, and a focal skin distance of 30 cm. The total dose was as follows: *first series*, 1,000 roentgens to each whole hand, given in daily fractions of 100 roentgens; *second series* (6 months later), 900 roentgens to three more affected joints, given in weekly fractions of 300 roentgens through a field 4 cm. in diameter.

Check-up roentgenograms made 8 months after the second series was completed showed a notable regression of the calcifications in the treated joints. In the other joints the condition of the affected parts was stationary or worsened. Roentgenograms of the toes which had never been irradiated showed that the calcifications had increased in number and size.

Following the description of his personal case, the author gives an extensive discussion of the various types of calcifications which may enter into the differential diagnosis. From the point of view of etiology, these may be divided into metastatic (from general causes) and dystrophic (from local causes). Among the first type are enumerated the calcifications due to (a) an imbalance of the complex endogenous mechanism of a hormonal-vitaminic nature which regulates the metabolism of calcium salts (hyperparathyroidism, hypervitaminosis D), (b) an increase of calcium-phosphorous ions in the blood as a consequence of other factors, e.g., extensive destruction of skeleton (neoplastic metastases, multiple myeloma), and (c) altered function of the kidneys with acidosis, when calcium is mobilized by the bones to counteract the acidosis. The second type includes the calcifications observed in local cellular degenerative processes, such as granulomas, inflammatory exudates, parasitic cysts, neoplasms, and ischemic tissues.

It is the author's view that his case cannot be classified in any of the afore-mentioned types. The particular morphology, which is the same in all calcifications, the localization at the medial or lateral margin of the metaphyses corresponding to the capsular insertion, the moderate inflammation of the affected joints, the normal blood findings, and the radiosensitivity are all factors which favor the diagnosis of peritendinitis calcarea. The only two elements against such a diagnosis are the patient's age and the multiple localizations.

—*T. Leucutia, M.D.*

Percutaneous Angiography with Special Reference to Peripheral Vessels. DAVID SUTTON. *Brit. J. Radiol.*, 1955, 28: 13.

THE INVESTIGATION of pathologic lesions by arteriography is a diagnostic method which has come into increasing prominence in recent years. The method, of course, is not new, for the original work on this subject was done more than 25 years ago.

The author analyses a series of some 250 cases in which percutaneous angiography was used for the investigation of the peripheral vessels of the limbs. The femoral artery and abdominal aorta were easily punctured, but puncture of the carotid and brachial arteries is more difficult. The most difficult punctures are those of the subclavian, popliteal, and vertebral arteries.

The indications for peripheral angiography may be broadly classified into two groups: the vascular lesions and the tumors and inflammatory lesions. The vascular lesions may be divided into the obliterative vascular lesions, emboli, aneurysms, angiomas, and traumatic arteriovenous fistulas. The obliterative vascular lesions are by far the most common. The numerically most important single group is the arteriosclerotic atheromatous type with narrowing and eventual occlusion of the main blood vessels. These cases present clinically with intermittent claudication as the most common single symptom. The roentgenologic diagnosis of atheromatous peripheral vascular disease by angiography is definite. Injections aid greatly in the location of the atheromatous involvement.

Among this series of angiograms there were more than 200 cases of peripheral vascular disease. Under 10 per cent of these were in the distal group, that is, those in which the vessels of the lower limbs down to the ankles were normal, with evidence of occlusion of the digital and main vessels below. The types of distal lesions that have been described are thromboangiitis obliterans (Buerger's disease), juvenile obliterans arteritis (Boyd *et al.*, 1949), endarteritis obliterans (Kramer, 1950), and peripheral arterial occlusion associated with diabetes. Raynaud's phenomenon may also be considered in this group if it is of the secondary type associated with organic disease. The classification of some of these lesions is a highly controversial subject.

Twenty-six cases of suspected tumors were investigated by angiography. The chief value of angiography in these cases would be to provide evidence of the presence of a malignant tumor. A negative arteriogram does not mean that the lesion is not a malignant tumor, but taken in conjunction with the clinical and other features it may provide valuable supporting evidence against a diagnosis of malignancy. Naturally it is the vascular, rapidly growing tumors which show ready evidence of malignancy by demonstration of pathologic vessels and increased vascularity. In this series 2 osteogenic sarcomas showed angiographic evidence of malignancy. On the other hand, of 3 fibrosarcomas involving bone, 1 had a negative angiogram, 1 was positive for pathologic vessels, and 1 was equivocal. A soft tissue fibrosarcoma showed no evidence of pathologic vessels, but on histologic examination was considered to be a low grade malignancy. A malignant synovioma and a malignant osteoclastoma showed the vascularity of a malignant tumor. A case of proved malignant angioendothelioma was examined with probably negative findings. In the investigation of 6 cases of secondary deposits in the peripheral bones, 2 secondary deposits from a silent carcinoma of the thyroid and secondary deposits from 2 cases of hypernephroma proved highly vascular. Six cases of benign lesions, examined angiographically, showed negative angiograms.

The author believes that percutaneous peripheral angiography is a diagnostic method which is deserving of more widespread use in the presence of vascular lesions and bone tumors.

—*Frank L. Hussey, M.D.*

The Hard Ray Technique in Roentgen Diagnosis (Die Hartstrahltechnik in der Roentgendiagnostik). U. Cocchi. *Fortsch. Roentgenstrahl.*, 1954, 81: 24.

The author, working in the fields of roentgenology and eugenics at the Central Institute of the University of Zurich, has examined several thousand roentgenograms prepared with the hard ray technique and gives his impressions as to the applicability of the method in the field of roentgenologic diagnosis. A series of roentgenograms taken with the standard technique and immediately followed by others made in the same patient with the higher voltages permits a comparison between the standard technique and the hard ray methods.

A table is included giving the technique of operation of the hard ray apparatus. The most favorable voltages in the author's experience have been those ranging from 100 to 125 kv.

Characteristic of the hard ray technique are the short exposure time, the relatively small amperage, the diminished irradiation effect on the patient, decrease of vagueness of delineation because of restlessness of the patient, increased life of the tube, and the decrease of the amount of electric current used. These advantages are of especial value in the roentgenologic examination of the stomach and intestinal tract with opaque material, of the vertebral column and pelvis, of the skull, and of such other parts of the body as give strong contrasts in shadow densities.

Other indications for the use of the higher voltages are in those conditions in which a series of exposures, is required, such as examination of the blood vessels after injection of opaque material (angiocardiography, cranial angiograms, arteriographies, and venographies), roentgen cinematography and tomography. The method would also seem to be absolutely indicated for bronchographic examination; but with this the author has had no experience. In the roentgenologic examination of the esophagus with the aid of opaque material, because of the irregular thoracic diameters, the use of the wedge-shaped filter is strongly recommended.

In examination of the urinary passages by ascending urography the same advantages are offered for the hard-ray technique as were listed with reference to the examination of the gastrointestinal tract. On the other hand, the hard-ray examination of the biliary passages (cholangiography) and of the urinary passages with descending, or intravenous, urography is apt to give such weak contrast depictions as to simulate nonfilling.

It must be emphasized that the hard-ray method requires exact technique, both as regards the control panel and the development of films. With the higher voltages one works with exposures of only a few hundredths of a second (0.02 to 0.04) and any over or under-exposure of the film can be corrected in the dark room only with the greatest difficulty.

—*John W. Brennan, M.D.*

MISCELLANEOUS

Tumors of the Thyroid and Radioactive Iodine (Tumori della tiroide e iodio radioattivo). Ugo Marinoni and Carlo Picchio. *Radiol. med.*, Milano, 1954, 40: 790.

Forty-seven cases of tumors of the thyroid gland are reported. Of these tumors, 22 were epitheliomas and 5 were sarcomas. The epitheliomas included 13 (48 per cent) adenocarcinomas (4 of alveolar, and 9 of papilliferous type); and 9 (33 per cent) of carcinoma solidum (8 of anaplastic cell type and 1 of polyhedral cell type). The sarcomas were all of fusocellular type.

All these patients were given the usual iodine fixation test: The ability of the primary tumors to take up iodine was extremely variable and ranged from 0 to 70 per cent; in the metastases it was slight or completely lacking. In all cases the surgeon was called into consultation so that no surgical possibilities would be overlooked.

Of the entire material, 21 patients were chosen for isotope therapy, the remainder being considered as not offering any prospect of cure, or even of amelioration by this method. In 14 of the 21 patients, some form of preliminary surgery was done with the intention of removing some of the mass of tissue which must be acted upon by the isotope and lessening the dosage which must be given. In 7 patients 100 units of a thyrotropic hormone (ambinon) were given for 8 consecutive days; the ability to fix iodine was increased, but this did not seem to affect the ultimate results.

Of the 6 patients treated solely by isotopes, 5 are dead and 1 is still living after 25 months, but with evidences of the disease still present. There was no evidence of even temporary cure from the method.

Of the 14 patients who received preliminary surgery, 7 are dead. The 7 patients who have survived present no evidence of recurrence or metastasis for from 7 to 35 months after initiation of the treatment. In this group the operation was intended to be of a radical nature and the results can be considered about equal to those to be expected from surgery alone. In order to evaluate the effects of the isotope treatment a longer period of observation and a greater number of cases would be required.

The results on the whole are rather discouraging. Disregarding the question of cure, there appeared to be only 1 patient in whom an amelioration of the pathologic condition could be affirmed. The conclusions of Crile of the Cleveland Clinic—that surgery is the method of choice in these patients—are still accepted.

In spite of the reported lack of success the author does not see a fundamental deficiency in the method itself. In instances in which there is a high degree of radiosensitivity of the primary tumor or its metastases, and in which the volume of tumor tissue is not so great as to require a dosage of isotope greater than the tolerance of the organism, the method is indicated and does not appear to be harmful. Even in instances in which the surgery can be carried out in a radical manner, with entire removal of the neoplasm, the treatment should be applied as a complementary

procedure in the hope that any tumor tissue missed, or any metastases not yet detectable may be capable of a biologic fixation of the isotope sufficient to benefit the patient. —*John W. Brennan, M.D.*

A New Method of Treatment of Inoperable Brain Tumors by Stereotaxic Implantation of Radioactive Gold—a Preliminary Report. J. TALAIRACH, G. RUGGIERO, J. ABOULKER, and M. DAVID. *Brit. J. Radiol.*, 1955, 28: 62.

THE AUTHORS present a preliminary report on the implantation of radioactive gold pellets into deep-seated brain tumors by stereotaxometry. As is known, cerebral stereotaxometry, according to Talairach, has been used for some time for the localization of intracranial lesions. It is based on the principle that, with the aid of a metallic plate fixed on the skull, any point located within the skull can be localized in space if it is visible in the frontal and lateral roentgenograms.

The authors proceed as follows: the brain tumor is first localized by fractional pneumography (particularly fractional encephalography via the lumbar route according to the technique of Lindgren) or by angiography, or by both methods. Then by the use of stereotaxometry the various points at which radioactive gold pellets are to be placed are selected and one or more burr holes are made. A blunt needle, 2 mm. in diameter, is introduced through the holes to ascertain that no cysts are present. After withdrawal of the blunt needle, a Selverstone needle is introduced through the same holes (following the intravenous injection of a radioactive tracer) and some tissue is aspirated. This procedure provides additional confirmation of the location of the tumor by the demonstration of a pathological radioactivity and the possibility of a histologic examination. Finally, the Selverstone needle is removed and the first needle is reintroduced, and one or more radioactive gold pellets are placed at the selected points. Checkup roentgenograms in the frontal and lateral views are made for control. The average total dose ranges from 20 to 60 millicuries.

The authors state that usually they perform radioactive gold implantation either through a craniotomy or through several burr holes in case of superficial tumors. The presently described method is recommended (1) for tumors which are very difficult to reach, such as brain stem tumors (particularly pinealomas and gliomas of the quadrigeminal plate) and tumors of the third ventricle and basal ganglia, and (2) for tumors of deep-seated origin, especially the tumors arising in the vicinity of the ventricular system.

They have employed the method in 5 cases, which are described in detail and illustrated with roentgenographic reproductions. All patients except 1 were in very poor general condition, and death appeared imminent. In 3 cases a very marked improvement was obtained and the other 2 failed to respond.

To avoid hemorrhage, the use of a bipolar electrode is indispensable, as it coagulates the entire path of the needle when the radioactive gold pellets are inserted.

The authors feel encouraged in pursuing their investigations to attain further refinement of this new method which permits treatment of inoperable brain tumors by radioactive gold pellet implantation with minimal injury to the surrounding area.

—*T. Leucutia, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Congenital Malformation; a Review. E. W. WALLS. *Arch. Middlesex Hosp.*, Lond., 1955, 5: 3.

FEW QUESTIONS are more difficult to answer than those posed by parents of congenitally malformed children. Until recently there was little understanding of the many factors which play a part in the causation of congenital defects. The magnitude of this problem is great. In the United States in 1944 the rate of death due to congenital malformations was 12.6 per 100,000 of the population.

It may be accepted that the causes of abnormal development are either hereditary, environmental, or an interaction of these two factors.

The material basis of inheritance is provided by the chromosomes, of which there are 48 in man. In some way not yet understood the determinants of hereditable character are located in the genes.

It is only partly true that the shelter afforded by the uterus ensures for its occupant an immunity from environmental changes. The passage of harmful agents such as certain toxins and infective material causes developmental abnormalities. Increasing maternal age causes an increase in developmental defects. The virus of rubella has been convincingly demonstrated as a factor producing congenital defects. Another environmental cause of fetal developmental defect is maternal nutritional deficiency. This has been demonstrated experimentally in animals, and it is reasonable to believe that such factors might operate in women as well. The dangers of irradiation of the pregnant woman have been amply corroborated by experimental work on animals.

The author concludes that the investigation being carried out shows that a fatalistic acceptance of such defects no longer exists and that in the future the incidence of congenital malformations may be materially reduced. —*Ely Elliott Lazarus, M.D.*

Will Fat Emulsions Given Intravenously Promote Protein Synthesis? Metabolic Studies on Normal Subjects and Surgical Patients. THEODORE B. VAN ITALLIE, FRANCIS D. MOORE, ROBERT P. GEYER, and FREDERICK J. STARE. *Surgery*, 1954, 36: 720.

IT HAS BEEN DEMONSTRATED that fat emulsions administered intravenously can maintain weight and nitrogen equilibrium in mature dogs receiving an oral diet inadequate in calories. Puppies receiving up to 30 per cent of their total energy requirements from fat emulsions given by vein grow as well as control animals receiving the same amount of fat in the diet. Also C-14 labelled fat in a finely emulsified form is rapidly and extensively metabolized in the rat when given intravenously.

This report is concerned with the metabolic effects of fat emulsions administered intravenously to 2 healthy volunteer subjects and to 2 surgical patients. The fat emulsion was tested in rabbits for pyrogenicity, and in rats and dogs for toxicity. In 1 of the normal subjects who was placed on a constant diet inadequate in calories and marginal with respect to protein intake, the nitrogen and potassium deficits diminished appreciably when intravenous fat was given and increased when the fat administration was terminated.

In a second normal subject on a constant diet inadequate both in calories and protein, no effect of intravenous fat on the nitrogen balance was discernible when the caloric intake was decreased by approximately 70 per cent as a result of discontinuance of the intravenous fat administration. However, the cessation of fat administration was followed by a marked increase in the potassium excretion.

Two surgical patients who underwent subtotal gastrectomy were given enough intravenous fat for a 6 day period following surgery to maintain their daily caloric intake between 1,800 and 2,000 calories per day. The extra calories from intravenous fat did not appreciably alter the characteristic metabolic response pattern to this type of operative procedure. Negative nitrogen and potassium balances occurred to a comparable extent in the 2 patients who received only intravenous fat in comparison to a control subject who received virtually all his caloric intake in the form of intravenous dextrose. Sodium retention in these subjects took place during the first postoperative week irrespective of caloric intake.

The authors wish to emphasize that supplemental intravenous fat may be of increasing importance in the maintenance of surgical nutrition especially in those patients who exhibit evidence of malnutrition preoperatively and in those patients who are unable to take an adequate amount of food by mouth postoperatively. —*Orville F. Grimes, M.D.*

An Immunological Concept of Cancer: Preliminary Report. H. N. GREEN. *Brit. M. J.*, 1954, 2: 1374.

THIS ARTICLE is a summary of investigations begun in 1948 concerning the resistance to transplanted tumors induced by chemical carcinogens and related compounds, and an immunological hypothesis of carcinogenesis. Noncarcinogenic polycyclic hydrocarbons which strongly inhibited the growth of some transplanted tumors were isolated from coal tar oil. These compounds compared with carcinogenic hydrocarbons were nontoxic and did not inhibit somatic growth. It was shown partly with the aid of cortisone that the tumor-inhibiting property was due to a stimulation of the immune reaction to homologous tumor tissue. Evidence is presented which favors the view that these compounds have the specific property of altering certain protein complexes so that they become isoantigens and thereby excite the production of homologous antibodies. In this regard, the plasma cell appears to have an important role in the immune response. Some evidence was obtained that chemical carcinogens when in intimate contact with red cells and epidermal cells induce the production of homologous antibodies to isoantigens in similar cells. It is suggested that tumor in-

hibition and carcinogenic capacity are closely related biologically. It is therefore postulated that the immune reaction induced by a carcinogen is the essential primary stage in chemical carcinogenesis.

It is suggested that all the tumor-inhibiting polycyclic hydrocarbons are able to induce the primary "initiation stage," but that only the carcinogens are able to "promote" the cells to the state of neoplasia by their additional nonspecific hyperplastic action. The basic concept suggested by this article is that all neoplastic cells lack one or more substances (probably protein complexes or their related enzyme systems) which confer tissue and individual identity on the cell. The cell thus becomes more antigenically "neutral" and does not attract in the same degree the normal immunologically related disposal mechanism. It is argued that this lack of "identity protein" constitutes in itself the neoplastic state.

—Orville F. Grimes, M.D.

A New Therapy for Prevention of Postoperative Recurrences in Genital and Breast Cancer; a 6 Year Study of Prophylactic Thyroid Treatment. ALFRED A. LOESER. *Brit. M. J.*, 1954, 2: 1380.

THIS is an interesting article which concerns the prophylactic treatment of breast and genital cancer after radical operation or x-ray treatment with thyroid hormone alone. The author suggests that such treatment might be the best weapon against cancer recurrence by upholding the normal cell metabolism. It has been shown that if a carcinogen (dibenzanthracene) is injected into mice, tumors are produced. However, if this carcinogen is injected together with thyroxin, the rate of disappearance of carcinogen from the tissue is increased and the tumor response is lowered. Thiouracil, on the other hand, greatly increased the incidence of dibenzanthracene-produced tumors. Thyroxin has little or no effect on the growth of already established dibenzanthracene-produced tumor. Thyroxin plays an important part in the normal cell defense by increasing the metabolic destruction of the carcinogen.

It was found in these studies that in hypothyroid individuals, representative skin biopsy samples showed less histamine content than in the hyperthyroid group. It is well known that in hypothyroid individuals, blood lipids are elevated. The author attempts to draw a quantitative relationship between the amount of thyroid hormones produced in the human body or artificially incorporated by thyroid treatment and the intracellular deposition of histamine. The histamine content in the cells is controlled by the thyroid hormone. The authors hypothecate that an increase in the thyroid hormone in the blood, high histamine content of tissue, and low blood lipid were associated with a decreased tendency to tumor formation. A decreased thyroid hormone in the blood, low histamine content in the tissue, and high blood lipid were associated with an increasing tendency to tumor formation. It seems logical to the author to treat women permanently with thyroid hormone after radical mastectomy or hysterectomy for cancer or after deep x-ray treatment in order to produce as much histamine as possible in the tissues and to depress the blood lipids and thereby strengthen the resistance of the host against possible cancer recurrence. With advancing years and declining thyroid activity, it is possible that many individuals will have cancer in situ somewhere in the body which remains latent so long as the thyroid gland is fully effective. It is suggested that thyroid hormones, although not able to destroy the actual cancer cells, may keep the cancer cells dormant for a long time, as the authors have seen in inoperable cancer of the breast, uterus, and ovaries.

Since October 1948, thyroid hormone in daily doses ranging from 1 to 5 gr. was given to patients who had undergone radical mastectomy or hysterectomy for cancer. No untoward symptoms were observed in the majority and the weight of the patients was not significantly influenced. Lipid examinations of blood were made from time to time. If the lipids declined too much (cholesterol under 100 mgm. per ml.) the thyroid dosage was decreased. If the lipids were normal or too high, the thyroid dosage was increased. Eighteen patients with far advanced cancer of either the breast, uterus, or ovary have been treated by this method and in only one patient has there been one certain recurrence.

Although the author does not wish to draw any conclusions from the results of the treatment of this group of patients, he believes that the present results warrant the use of prophylactic thyroid hormone treatment since only by large scale studies will the true value of this method become established.

—Orville F. Grimes, M.D.

DUCTLESS GLANDS

Characteristics of Adrenal-Dependent Mammary Cancers. CHARLES HUGGINS and THOMAS L-Y. DAO. *Ann. Surg.*, 1954, 140: 497.

AN ANALYSIS of 100 patients with recurrent advanced cancer of the breast has demonstrated some features of steroid dependency which may be correlated with beneficial results obtained by adrenalectomy, and which may be applied to the selection of cases for that procedure. Of 100 patients, 38 obtained remissions of their disease for periods of up to 3 years; 55 others were not benefited.

More favorable results occurred in women between the ages of 40 and 65. Using the interval between radical mastectomy and the appearance of metastases as an index of the growth rate of the cancer, favorable results were obtained in the slowly growing tumors (3 or more years).

Adenocarcinomas composed of microscopic spheroid clusters of cells which form one-cell-thick acini containing secretion seem to constitute a specific functional category of mammary cancers which is particularly responsive to adrenalectomy. Twenty-nine of the 38 favorable cases were in that category. It was noted that women with that type of cancer excreted significant amounts (median value, 16 I.U. in 24 hours) of estrogen after ablation or irradiation of the ovaries. Twelve women with the spheroid adenocarcinomas responded to the stimulation of lactation by producing milk in the remaining breast. That response, produced by 500 I.U. of pituitary luteotrophin given daily for 7 days, indicated physiologic maturity of the mammary epithelium. Nine other women with partly or totally undifferentiated tumors did not lactate when so tested.

Pearson has described increased calcium excretion in the urine following the administration of estrogens to some patients with osseous metastases. He believes that is an indication of estrogen dependency, as is also the more commonly favorable result of adrenalectomy in patients who have had remissions following oophorectomy. —*Leonard D. Rosenman, M.D.*

SURGICAL PATHOLOGY AND DIAGNOSIS

Clinical Use of the Urinary Uropepsin Determination in Medicine and Surgery. SEYMOUR J. GRAY, COLIN G. RAMSEY, and ROBERT W. REIFENSTEIN. *N. England J. M.*, 1954, 251: 835.

UROPEPSIN IN THE URINE represents a constant fraction of the total pepsinogen production by the peptic chief cells of the stomach; consequently, it accurately reflects gastric pepsin secretion. Clinical implications include the study of peptic ulcer, pernicious anemia, gastric cancer, measurement of the gastric response to adrenocorticotrophic hormone stimulation, and conditions of stress. Previous studies have indicated that the prolonged administration of ACTH and cortisone induces a significant increase in gastric activity and a concomitant increase in uropepsin excretion to levels observed in patients with active peptic ulcer. Development of pain in the epigastrium, or acute or chronic duodenal ulcer de novo after the administration of these hormones is invariably accompanied by considerable increase in the uropepsin excretion. The studies reported deal with the measurement of uropepsin excretion in a group of 120 normal patients, and about 500 abnormal patients.

Patients with duodenal ulcer excrete a greater amount of uropepsin than normal patients. The output of uropepsin remains elevated even though the ulcer has healed. The appearance of any of the complications of duodenal ulcer does not alter the elevated uropepsin excretion. The patients with gastric ulcer excreted less uropepsin than those with duodenal ulcer, but more than normal patients. People with gastric cancer excreted less than normal patients, and those with pernicious anemia excreted extremely small amounts.

Subtotal gastric resection reduces the uropepsin output, correlating well with the amount of stomach removed. Uropepsin completely disappeared from the urine following total gastrectomy. Vagotomy used as a means of treatment of peptic ulcer does not reduce uropepsin excretion to normal. The appearance of a marginal ulcer after subtotal gastric resection returns uropepsin excretion to the range found in patients with active duodenal ulcer. The increase in uropepsin excretion produced by the administration of ACTH or cortisone is not inhibited by removal of the gastric antrum or by performance of a vagotomy.

Uropepsin output measures adrenocortical activity as indicated by: (1) parallelism with 17-hydroxycorticoid and 17-ketosteroid excretion, (2) diminution in uropepsin excretion in patients with panhypopituitarism and Addison's disease, (3) increased excretion of uropepsin in the endocrine deficiency states with appropriate replacement therapy (output did not increase with desoxycortisone acetate, whereas, it did with cortisone), (4) increased excretion in patients with adrenal or pituitary hyperactivity, and (5) increased excretion in stress states such as burns, surgery, or acute myocardial infarction.

The determination of uropepsin excretion has proved of clinical value in the differential diagnosis of gastroenterologic and endocrinologic diseases and is a measure of gastric secretory activity and adrenal cortical function. These studies also support the concept that acute and chronic stress states stimulate the stomach and increase uropepsin excretion by means of a humoral mechanism involving the hypothalamic-pituitary-adrenogastric axis, and that it is independent of the vagus nerves or the gastric antrum.

—*Jerry A. Stirman, M.D.*

EXPERIMENTAL SURGERY

An Experimental and Clinical Investigation of the Effect of Low Temperature on the Viability of Excised Skin. TORD SKOOG. *Plastic & Reconstr. Surg.*, 1954, 14: 403.

THE VIABILITY of skin stored at various temperatures was studied in rats by quantitative measurements of respiration, and the results were correlated with the survival of the grafts. The experience from these experiments was applied to human skin; oxygen consumption as measured by Barcroft-Warburg's micromethod was found to give a useful quantitative index of the viability of the skin.

Full thickness skin stored at plus 3 degrees C. showed a gradual decrease in metabolism and its vitality after 3 weeks was below the requirements for successful grafting. Full thickness skin stored at minus 70 degrees C. and then thawed was almost indistinguishable from a fresh specimen. It showed no statistically significant decrease in the rate of oxygen consumption or in healing capacity when stored from 1 to 20 weeks.

Human split-thickness grafts stored at minus 70 degrees C. for 4 or 13 months were grafted as homografts, in 3 cases with complete success, and the quality of these grafts was quite as good as that of fresh homografts.

Apparently skin stored at minus 70 degrees C. might retain its viability for practically unlimited periods of time. The storage procedure is simple and does not seem to affect the quality of the homografts adversely. It would seem, therefore, to be "the method of choice" in the establishment of skin banks specifically for use in the treatment of burns.

—*Ely Elliott Lazarus, M.D.*

Effect of Slow and Rapid Warming on Prolonged Chilling and Freezing of the Legs of Dogs. MARTIN A. ENTIN, G. A. SCHULTZ, and HAMILTON BAXTER. *Angiology*, 1954, 5: 486.

IN ORDER to get away from the complete freezing of the tissues which attends the exposure of the extremities of small experimental animals, the authors selected mongrel dogs for their studies; the thighs of dogs have a tissue mass comparable to that of the hand or foot of man. The anesthetic agent used was sodium nembutal, and the freezing agent was 95 per cent ethyl alcohol and solid carbon dioxide. The effect of rapid warming on the thighs of dogs exposed to a range of temperature from 0 to —20 degrees C. was studied.

The foot and lower leg were protected from cold injury to avoid secondary complicating factors, such as infection and thrombosis.

Of the total of 74 dogs used in this experiment, 11 died during the period of exposure to the freezing fluid, and 9 died before the end of 2 weeks. The deaths during the period of exposure were associated with a greater than 6 to 10 degree C. drop in body core temperature in the first 4 hours. It would appear that continuous and excessive loss of heat associated with prolonged chilling in dogs is potentiated by the dual action of nembutal in depressing the respiratory centers as well as disturbing the temperature-regulating mechanism. This effect, in combination with other factors, contributed to the fairly high mortality.

Thermocouples were used to record superficial and deep temperatures of the tissues of the thigh exposed to cold. The range of temperature from 0 to —7 degrees C. did not produce actual freezing of the tissue and thus may be similar to the "immersion fat" type of injury. In the range of temperature from —10 to —20 degrees C., actual freezing of the superficial tissues occurred in many of the limbs. In general, the extent and depth of injury were greatest in the animals in which the temperature of the chilled tissues was lower, especially if the lower temperature was maintained for long periods of time. However, there were marked variations in amount and necrosis of skin among different dogs, depending on a number of different circumstances and the response of the individual vascular system. Necrosis of the skin occurred without actual freezing, but it required prolonged exposure to cold. Permanent injury to the muscles, determined by histologic examination after autopsy, was observed only when there was necrosis of the overlying skin. The reduced temperature of the tissues and probable consequent decreased blood supply during exposure to the cold was one of the main factors in determining the final extent of injury.

Almost all of the animals which sustained measurable injury showed greater damage in the leg which had been warmed to room temperature. Immediate rapid warming in a bath at 42 to 45 degrees C. markedly reduced the extent of skin necrosis when a large mass of tissue was exposed to cold.

—*Edwin J. Pulaski, M.D.*

Studies in Surgical Endocrinology; the Urinary Excretion of 17-Hydroxycorticoids and Associated Metabolic Changes in Cases of Soft Tissue Trauma of Varying Severity and in Bone Trauma. F. D. Moore, R. W. Steenburg, M. R. Ball, G. M. Wilson, and J. A. Myrden. *Ann. Surg.*, 1955, 141: 145.

Changes in the function of the endocrine glands have been reported many times as a feature in the recovery of injury and surgery. Although the data so far presented are inconclusive, the unfolding picture is that of convalescence as an extensive endocrine adjustment which is analogous in scope to such other life situations as growth, puberty, pregnancy, or senescence. The present studies were undertaken to compare the urinary excretion of 17 ketosteroids with the urinary excretion of 17 hydroxycorticoids, and the relation of both to the clinical and metabolic events in surgical patients. Eleven patients were studied with respect to clinical events, metabolic balance, and certain indices of endocrine activity. The metabolic methods consisted of balances of nitrogen, potassium, sodium, and chloride. Intake and output were calculated, blood loss measured, and accurate daily body weights obtained. The endocrine methods consisted of a determination of the eosinophile counts, the urinary excretion of 17 ketosteroids, and of 17 hydroxycorticoids.

It was determined that the duration and magnitude of nitrogen negativity correlates closely with the extent of trauma. The phase of nitrogen negativity is followed by one of positivity in most cases. Sodium conservation was marked in many of the cases and was longer in duration than could be predicted. Following operation or trauma, potassium is lost in a high ratio to nitrogen, but in most cases the potassium balance became positive before the nitrogen balance. Minor trauma induced very transient eosinophile changes. The duration and magnitude of elevation in urinary excretion of 17 hydroxycorticoids also correlates closely with the nitrogen loss and the magnitude of the trauma. The excretion of 17 ketosteroids was irregular and unpredictable, and not correlated with any clinical or chemical indices. A tendency to lose fat and relative water was noted.

The authors state that this field of work is in a phase of development where methods and interpretations are changing constantly and where new techniques should be explored to see what further light they cast on the endocrinology of trauma.

—*Ely Elliott Lazarus, M.D.*

A Review of the Conference on the Relation of Immunology to Tissue Homotransplantation. Blair Oakley Rogers and John Marquis Converse. *Plastic & Reconstr. Surg.*, 1954, 14: 261.

The role of immunological mechanisms in the failure of most homografts to survive permanently was discussed at a conference held at The New York Academy of Sciences, on February 12 and 13, 1954. Subjects discussed included the acquired immunity hypothesis, the role of serum and cellular antibodies, individual-specific or shared antigens, embryonic versus adult immune mechanisms, and induced alterations of the acquired immune reaction.

The acquired immunity hypothesis is based on several observations. First, a lapse of 5 to 7 days usually occurs before the evidences of rejection such as vascular thrombosis and necrosis occur. This 5 to 7 day period is comparable to the average time period during which the body builds up effective antibody levels against foreign antigens. Second, the "second-set phenomenon" is demonstrable when a second set of homografts taken from the same donor and transplanted to the same host sloughs more rapidly than the first set of homografts. This is attributed to an acquired immunity reaction previously developed in the host against the presence of first-set grafts. Third, studies of second-set bone homografts reveal that the inflammatory reaction in the region of these grafts is more intense than that observed around the first-set bone homografts.

Serum and cellular antibodies. Specific circulating antigens have not been demonstrated. Failure to demonstrate these antibodies may be due to low cir-

culatory levels of antibody not detectable by current techniques. Attempts have been made to demonstrate circulating antibodies in the globulin fraction of blood serum at the site of a sloughing skin homograft. Radioactive I^{131} was used to label the globulin. Assuming that the antibody is carried by the globulin fraction, the presence of an increased amount of radioactive iodine in and around the site of the homograft should indicate increased antibody at the site of the graft. No such increase of radioactivity was observed. It is thought that the failure of this attempt might be attributed to the possibility that cellular antibodies, not serum antibodies, are chiefly responsible for the rejection and sloughing of skin homografts.

"Individual-specific" shared antigens. Specific circulating antibodies have not been demonstrated. Circumstantial evidence has indicated the existence of individual-specific cellular antigens common to different cells or tissues of the same animal or individual. A human case was studied in the attempt to demonstrate antigens shared by human skin. A severely burned girl received skin homografts from her father; no blood transfusions were administered from father to daughter. Both the patient and father were of blood group A, Rh negative. The patient's serum contained no demonstrable antibodies against the father's erythrocytes prior to the grafting procedure. Following the sloughing of the homografts donated by the father, however, the serum of the patient showed a positive antiglobulin reaction with the donor's erythrocytes. The conclusion drawn from this case is that human skin and erythrocytes probably share some antigens in common.

On the basis of the analogy of the blood-group conditions in man one must realize that within the human species there are probably so many different genetically determined antigen types bound to the skin cells that it would be extremely rare that any 2 human beings chosen at random would ever present the same combination of individual-specific antigens in their skin tissues.

The use of embryonic, fetal, or neonatal tissue as homografts in preference to adult tissue homografts in transplantation procedures promises a more rapid advance in solving the homotransplantation problem. Tissues incompatible as homografts in their adult state, are often compatible as homografts when transplanted in their embryonic state.

Induced alterations of the acquired immune reaction. Investigators have tried to overcome the acquired immune reaction to homografts by treating the donor and/or the host with ACTH, cortisone, antihistamines, desensitization injections, irradiation, and blockage of the reticuloendothelial system. A prolonged or increased "survival time" of skin homografts following such measures has been reported. A plea is made for more accurate determination of the "survival time." This is defined as the period which elapses from the time of transplantation to the first sign of circulatory impairment within the homograft; these progressive signs are stasis or stagnation of the blood flow, vascular thromboses, increased vascular permeability, rupture of the vessel walls, and, finally, spillage or diffusion of erythrocytes into the perivascular tissue spaces of the graft.

Permanent survival of skin homografts following the creation of a state of immunoparalysis seems to validate the "acquired immunity" hypothesis discussed at this conference according to the authors. It is hoped that refinements of this technique may result in the permanent survival of tissue homografts in man.

—F. W. Pirruccello, M.D.